SECTION 8F

FINISH HARDWARE, THRESHOLDS, WEATHERSTRIPPING

1. GENERAL:

   A. Samples as may be requested and six copies of itemized schedule of finishing hardware must be submitted to the Architect prior to the placing of any orders for hardware. Approval of this schedule does not in any way relieve the Contractor of his obligations to supply proper hardware as may be specified.

   B. The Contractor shall include all necessary hardware for complete operation of all doors as specified. The omission of any door from the following does not relieve the Contractor of his obligation to supply proper hardware for same. For any door not mentioned, furnish hardware of same type as a similar opening, subject to the Architect's approval.

   C. It is a contract requirement that after complete installation of all hardware, the hardware supplier shall inspect all items of hardware for proper installation and adjustment. All locks shall be checked for proper handling, closers and shall be checked and adjusted as necessary for tension; closing and latching speeds; stops shall be checked for installation and placement. A written report of this inspection and adjustment shall be filed in six copies with the Architect.

   D. Unsuitable hardware: Where the finished shape or size of any member taking hardware is such as to prevent use of the exact item specified furnish hardware of same quality and operation to suit conditions.

2. PRODUCTS:

   A. Materials: Included in the following are manufacturers of products shown under Hardware Sets, followed by manufacturers whose equal products will be accepted.

   B. Finish: The finish throughout shall be US-26D Dull Chromium except for butt hinges which shall be prime coat, door closers which shall be sprayed aluminum. Push, pull and kick plates shall be US 32D satin stainless steel.

   C. Design of locksets shall be Schlage Luna.

   D. Butt hinges shall be products of Stanley, McKinney, Hager and Soss.

      (1) Provide FBB173 butts at all wood B label doors.
      (2) Provide FBB179 at all other doors equipped with closers.
      (3) Provide F179 butts at all other doors.
      (4) Sizes shall be 4-1/2 x 4-1/2 for 1-3/4" thick doors 3'0" and under.
      (5) Provide non-removeable pins at all outswinging exterior doors.

   E. Closers shall be by LCN as shown. Closers shall be mounted to the door with through bolts. Closer sizes shall be as per factory recommendations.

F. O. H. stop and holders shall be as shown by Glynn-Johnson or by Check-mate.

G. Door stops and bumpers where possible shall be Baldwin 4032 wall bumper. When conditions prevent use of wall bumpers, provide 4000 or 4005 dome stops or 534 roller bumpers as necessary. Provide with fastening device to suit mounting conditions. Stops by H. B. Ives, Glynn- Johnson are approved.

H. Push and pull plates shall be 550K and 550K x 43 by Cipco Corp. or by Brookline or Quality.

I. Kick plates shall be 5150 by Cipco Corp. or equal by Brookline or Baldwin. Kick plates shall be 8" high x 2" less than door width.

J. Silencers shall be Glynn-Johnson 64 or equal by Baldwin or Sargeant and Greenleaf. Furnish 3 for each single door, 4 for each pair of doors.

K. Locksets shall be of type and function shown, products of Schlage Lock Co.

L. Cabinet hardware shall be as shown by Amerock or by Stanley.

M. Drawer slides shall be as shown by Knape and Vogt or by Grant.

N. Adjustable shelving shall be as shown by Knape and Vogt.

O. Lever flush bolts shall be as shown by Ives or Baldwin.

P. Thresholds shall be Pemko as shown or equal by Zero or Reese.

Q. Weatherstrip shall be provided at all exterior doors and hinged doors to Engine Room. Weatherstrip shall be Pemko 305AR or equal by Zero or Reese.

R. Key control cabinet: Provide one cabinet P.O. Moore RWC 25S.

S. Plaque: Provide one cast aluminum plaque 16"x18" as per details to be provided.

3. EXECUTION:

A. Keys and keying: All cylinder locks will be:

(1) Grand masterkeyed in one set.
(2) Masterkeyed in two sets.
(3) Furnish three keys per lock, 6 masterkeys each set, and 6 grand masterkeys.

B. Templates shall be furnished as may be required in order that all members receiving hardware may be properly prepared.

C. Packing and marking: Each item of hardware shall be marked showing its intended door location. All items shall be packaged with all screws necessary for installation.

D. Hardware sets

Set 1: Pairs Doors 1
Each pair to have:
6 Butts
1 Lockset G51PD x 17-004
2 Lever Flush Bolt
2 Closer 4110-H-Cush
2 Kick plate
1 Threshold 181A
2 Door Sweep 315AN
Weatherstrip 305AR (Head, Jambs)
Weatherstrip 305AN (Meeting rail)
4 Silencer

Set 2: Doors 4, 5, 6, 11, 21, 27, 28, 35, 38, 41, 42, 49, 51, 52, 55, 57, 59, 60
Each door to have:
3 Butts
1 Lockset D51PD
1 Stop
3 Silencer
1 Threshold 170A (Doors 2, 27, 59)
1 Electric latch release Folger-Adam no. 712-26D-24VAC (At door 5 only)

Set 3: Doors 3, 46
Each door to have:
3 Butts
1 Lockset D51PD
1 Closer 4010 (4110 at 46)
1 Stop
3 Silencer
1 Threshold 170A

Set 4: Prs. Doors 13
Each pair to have:
6 Butts
2 Push Plate
2 Pull Plate
2 Kick Plate
2 Closer 4110-HO
2 Stop
4 Silencer

Set 5: Doors 12, 15, 20, 22, 24, 29, 32, 33, 36, 37, 39, 47, 48,50, 53, 54
Each door to have:
3 Butts
1 Latchset D10S
1 Stop
3 Silencer

Set 6: Doors 8, 19

Each door to have:

3 Butts
1 Push Plate
1 Pull Plate
1 Kick Plate
1 Closer 4010-HO
1 Deadlock B460P
1 Stop
3 Silencer
1 Door Sweep 315 AN
Weatherstrip 305 AR
1 Threshold 170A

Set 7: Doors 9, 18

Each door to have:

3 Butts
1 Push Plate
1 Pull Plate
1 Kick Plate
1 Closer 4110-HO
1 Deadlock B460P
1 Stop
3 Silencer
1 Threshold 170A
1 Door sweep 315 AN
Weatherstrip 305 AR

Set 8: Doors 10

Each door to have:

3 Butts
1 Lockset D51PD
1 Closer 4110
1 Stop
3 Silencer

Set 9: Doors 7, 14, 23, 26, 31, 43, 44, 58

Each door to have:

3 Butts
1 Push Plate
1 Pull Plate
1 Kick Plate
1 Closer 4010 (doors 14, 23, 43, 44)
4110-H (doors 26, 31)
1 Stop 4110 - (door 7)
3 Silencer
1 Threshold 170A (doors 7, 14, 23, 43, 44, 58)

Set 10: Doors 16, 34

Each door to have:

1 Panic Device 33-DT
1 Closer 4110-H-Cush x 4110 -18
1 Stop
1 Threshold 181A
1 Door Sweep 315AN

Set 11: Doors 17, 30, 56
Each door to have:
3 Butts
1 Lockset G 80PD
1 O.H. Stop GJ-80-M-HD series
3 Silencer
1 Threshold 181A

Set 12: Doors 2, 25
Each door to have: (except as noted)
1 Cylinder 20-011-626 (Door 25)
1 Cylinder 20-022-626 (Door 2)
1 Closer 4110-H-Cush x 4110-18
1 Panic device 33-NL (Door 2)
1 Electric latch release No. 3011-26D-24VAC (Door 2)
1 Stop
1 Threshold 181A
1 Door sweep 315AN

Set 13: Doors 40
Each door to have:
3 Butts
1 Lockset D40S
1 Stop
3Silencer
1 Threshold 170A
1 Auto Door Bottom 412A
Weatherstrip 305AR

Set 14: Doors 45
Each door to have:
3 Butts
1 Lockset D40S
1 Stop
3 Silencer
1 Threshold 170A

Set 15: Cabinets
Each door to have:
2 Hinges 5987P or 7636P
1 Catch 9714-2G
1 Pull 4484-26D
Each drawer to have:
1 Set slides 1300
1 Pull 4484-26D

Set 16: Adjustable Shelving to be:
Standards KV-255-A1
Supports KV-256-A1

Set 17: Closet Rods
To be as detailed:
Stanley 7036N

Set 18: Coat and Hat Hooks
In spaces 113
KV-3-5"

Set 19: Cast Aluminum Plaque
To be 16" x 18" as per details

SECTION 8G

ALUMINUM STOREFRONT

1. GENERAL:

   A. Provide 5 copies of shop drawings indicating dimensions, layout, member sizes and gauges and anchorage details.

   B. Protection: Contractor shall protect material from surface abrasions and other damage.

2. PRODUCTS:

   A. Vertical and horizontal tubing shall be extruded aluminum, minimum, .125 thickness, 2" x 5", No. 61-208.

   B. Sash units shall be extruded aluminum No. 69-184. Glazing shall be vinyl.

   C. Door stop shall be extruded aluminum no. 69-177.

   D. Doors shall be model 350, medium stile. Provide the following:

      (1) Door 2: Butts.

      (2) Door 16: Butts.
      (3) Door 25: Butts, MS 1850 Adams-Rite maximum security deadbolt, push bar and pull plate standard with manufacturer.
      (4) Door 34: Butts.
      (5) Door closer, panic devices and thresholds furnished under Section 8F.
      (6) Glass furnished under Section 8E.

   E. Manufacturers: Part numbers and model numbers used herein are Kawneer Products. Finish shall be 204A1R1. Products by Anaconda and PPG Industries are acceptable.

   F. Caulk:
      (1) Mono-lasto-meric by Tremco Manufacturers.
      (2) 60# Unicrylic by Pecorn Chemical Corp.
      (3) Acrylic Terpolymer by Dick-Armstrong-Pontius.

3. EXECUTION:

   A. Aluminum storefront shall be installed as indicated on drawings.

   B. Framework shall be plumb, true to line, and securely anchored.

   C. Secure each jamb to masonry with minimum 4-1/4" bolts in expansion shields.

   D. Exposed screws will not be permitted on exterior of framing.

SECTION 9A

TERRAZZO

1. GENERAL:

   A. Reference standard: 1977 edition of the National Terrazzo and Mosaic Association, Inc.

   B. Terrazzo floor color shall be plate no. S124.

   C. Divider strips shall be placed as indicated on drawings.

   D. Terrazzo installation shall be sand cushion method.

   E. Sample: Provide 12" x 12" sample of terrazzo and 6" length of each type divider strip specified.

   F. Maintenance literature: Upon completion, the Contractor shall furnish the Owner with 2 copies of the NTMA documents on the care of terrazzo.

2. PRODUCTS:

   A. Portland cement: ASTM C150, Type 1, White.

   B. Sand: Clean, hard, conforming to ASTM C33 for fine aggregate.

   C. Marble chips: Standard quarry products of size and color to match color selected.

   D. Pigments shall be lime proof, non-fading mineral of synthetic pigment.

   E. Reinforcement shall be 2 x 2-16/16 galvanized conforming to ASTM C185.

   F. Water shall be clean, clear and drinkable.

   G. Isolation membrane shall be 4 mil polyethylene conforming to ASTM C156.

   H. Divider strips shall be 1-1/4" deep

      (1) M. J.:
          (a) Plastic strip (black) (Heavy Top Style - 1/8" thick) by Manhattan American Terrazzo Strip Co.

      (2) M. E. J.:
          (a) Standard type, 1/8" Black neoprene filler by Manhattan American Terrazzo Strip Co.

      (3) Provide accessories, splice plates and aligners.

I. Curing material shall be liquid membrane, wet sand, polyethylene, or clean water.

J. Neutral cleaner shall be a neutral liquid cleaner prepared for the terrazzo trade.

K. Sealer shall be penetrating type, free from harmful alkali or acid content. Sealer should be specially prepared for the terrazzo trade.

3. EXECUTION:

A. Preparation of slab: Slab shall be clean and covered with 1/8 to 1/4 inch of sand and screen to a uniform level. Over the sand install one layer of isolation membrane as specified, overlapping the edges. Place the mesh reinforcement, lapping 2 squares and tie mesh at all divider strip locations. Stop mesh minimum 1" short of M. E. J.'s.

B. Underbed shall consist of one part Portland cement and four to five parts clean, sharp sand. Mix with sufficient water to produce workability. Apply screed to uniform levels or slopes required. Screed shall be brought to within 1/2" of finished floor elevation to allow for regular terrazzo topping.

C. Divider strips: While the underbed is semi-plastic install divider strips specified in accordance with layouts. Set accurately, straight, and to levels required. Trowel firmly along edge of the divider strips to assure anchorage in the underbed. See floor drain plan for location of MJ's and MEJ's.

D. Terrazzo topping: Standard topping shall be 200 pounds of marble chips per 94 pound bag of White Portland cement. Chips and cement to be identical to those used in approved sample and selected from the National Terrazzo and Mosaic Association, Inc., color plates. Color pigment shall be mixed in with the dry ingredients. When thoroughly mixed add 5 gallons of water per bag of cement. Adjust amount of water to allow for water present in marble chips. Use the same amount of water in each batch mixed.

E. Placing topping: Slush underbed with neat cement grout of same type specified for the topping; broom into underbed surfaces. Where color pigments are required, add like proportions to grout. Place terrazzo topping in the panels formed by the divider strips; trowel to surface even with the top of strips. Seed surfaces with same proportions and kinds of marble chips contained in topping. Trowel the sprinkled marble chips uniformly over finish and roll with heavy rollers until all excess water has been extracted. Trowel to uniform surfaces disclosing the lines of divider strips.

F. Curing terrazzo topping: Curing shall be in strict accordance with the National Terrazzo and Mosaic Association's recommendations.

G. Finishing:

(1) Grinding: The initial rubbing shall be accomplished by floor machines outfitted with No. 24 finer grit stones. A second rubbing, using No. 80 or finer grit stone, shall immediately follow initial rubbing.

(2) Grouting: Immediately following rough grinding, surfaces shall be cleaned with sufficient clean water to remove dust and fines. Rinse thoroughly with clean water. Remove excess and apply paste consistency Portland grout of type employed in the topping by hand of machine with pigment added in like amounts where called for in matrix; fill all voids.

(3) Curing grout: As soon as the grout has obtained initial set, cover the entire surface with a generous application of specified curing material, allow to remain indefinitely to help protect finishes from staining until final polishing.

(4) Fine stoning: Final machine rubbing shall not take place sooner than three days following the grouting. The grouting shall be removed by means of floor machines using No. 80 or finer grit stones. Upon completion of the final rubbing, the terrazzo finish shall show an average of not less than 70-75% of marble chips.

H. Cleaning: Immediately following the machine rubbing or fine stoning, wash all surfaces with a solution of neutral cleaner and rinse.

I. Sealing and finish treatments: As soon as the terrazzo surfaces are thoroughly dry, apply sealer. The sealing shall be done in strict accordance with the manufacturer's directions.

J. Protection of finishes: Upon completion of the sealing, the Contractor shall provide protection of finished surface.

SECTION 9B

ACOUSTICAL TILE CEILING

1. GENERAL:

A. Submittal: Furnish 5 copies of shop drawings showing layout of tile and grid system. Spaces shall be identified. Indicate locations, direction, part number, and gauge of main runners and cross tees and location of light fixtures, diffusers, grilles, skylights, and other ceiling outlets.

B. Samples: Furnish 2 - 12 inch x 12 inch samples of each type ceiling tile required and 2 of each component used in grid system with part number marked thereon.

C. Temperature requirements: Before installation commences, spaces to receive acoustical tile system shall be at a minimum temperature of 50° F.

2. PRODUCTS:

A. Ceiling panels: 24 inch x 24 inch x 5/8 inch thick, Class A incombustible, standard white factory finish. Minimum panel density shall be 16 pounds per cubic foot.

(1) Cortega - Minaboard by Armstrong Cork Co.
(2) Non-Directional Fissured Auratone by United States Gypsum
(3) Regency by Conwed
(4) Non-Directional Fissuretone by Celotex Corp.

B. Exposed grid system:

(1) Main runners:
(a) DB-28 by Donn Products Corp.
(b) No. 6349 by Eastern Products Corp.
(c) ML-8000 by National Rolling Mills

(2) Cross tees:
(a) DB-416 by Donn Products Corp.
(b) No. 6424 by Eastern Products Corp.
(c) ML-3148 by National Rolling Mills.

(3) Finish shall be low sheen satin white.

C. Angle moulding: (All Spaces)
(1) M-6S by Donn Products Corp.
(2) No. 6408 by Eastern Products Corp.
(3) M-6100 by National Rolling Mills

D. Hanging Wire: No. 12 gauge galvanized.

3. EXECUTION:

A. Ceiling assembly shall be installed level and free from vertical or horizontal movement.

B. Main runners shall be spaced at 48 inches o.c. and supported by hanging wire attached to steel joist or beams and main runners.

C. All four corners of ceiling framework carrying recessed light fixtures shall be supported by hanging wire attached to steel joist, beam or steel deck.

D. Angle moulding shall be installed where ceiling panel abuts vertical surface.

E. Where ductwork prevents attachment of hanging wire to steel joist or metal deck as required, provide additional framing members secured to adjacent walls, beams, steel joist to which hanging wires can be attached.

F. Damaged or discolored tile or grid components shall be removed and replaced.

G. Provide hold-down clips on all panels in space 101 and at doors 9, 18

SECTION 9C

CERAMIC TILE

1. GENERAL:

A. Samples: Furnish 2 - 6 inch x 6 inch sheet of each color used and 2 of each trim shape.

B. Delivery and certificate: Material shall be in grade marked in sealed containers.

C. Cleaning: Upon completion and before final acceptance, floors shall be cleaned of dirt, dust, and foreign matter.

D. Temperature for installation of tile shall be 40° F. and rising.

E. Storage: Tile shall be stored in a clean dry area to prevent wetting or staining.

F. Wall Tile: Trim pieces and tile accessories shall be of one manufacturer and of the same color.

2. PRODUCTS:

A. Ceramic tile:

(1) Floors: 1 inch x 1 inch x 1/4 inch thick ceramic mosaic with smooth all purpose edge.

(2) Base: 4-1/4 x 4-1/4, Bright glazed.
- (a) Cove Runner: A-3401
- (b) Outside corner: ACR-3401 or ACL-3401
- (c) Inside corner: ABL-3401 or ABR-3401

(3) Wall: 4-1/4 x 4-1/4, Bright glazed
- (a) Flat: 4-1/4 x 4-1/4
- (b) Inside corner: A-3401
- (c) Outside corner: A-4402
- (d) Top of wall inside corner: ABL-4402 or ABR-4402
- (e) Top of wall outside corner: AN-4402
- (f) Top of wall runner: A-4402

(4) Shower Curb:
- (a) Cap runner: 2 halves - A-4402
- (b) Cap at junction vertical partition: 1/2-ACL-3401 or 1/2 ACR 3401 and 1/2 ABR 4402 or 1/2 ABL-4402

(5) Manufacturers:
- (a) American Olean Tile Co. (Floor-Texline)
- (b) Products by Romany-Spartan, Florida Tile Co. and Monarch Tile Co. are acceptable.

B. Soap Holder and Rail:
- (a) No. 541 by American Olean
- (b) Products by Romany-Spartan, Florida Tile Co. and Monarch Tile Co. are acceptable.

C. Soap Holder (Flush Type) (Spaces 109, 122, 011, 012, 014)
   (a) No. 403 by American Olean
   (b) Products by Romany-Spartan, Florida Tile Co. and Monarch Tile Co. are acceptable.

D. Portland cement for setting bed: Waterproof type, ASTM C-150, Type 1.

E. Sand: ASTM C-144.

F. Grout: Commercial cement grout, waterproof, White.

G. Water: Fresh and clean.

3. EXECUTION:

A. Setting bed (thickness 3/4 inch minimum to 1-1/4 inch maximum): 1 part Portland cement to 6 parts damp sand by volume.

B. Ceramic tile shall be laid out so that no less than 1 half size tile is installed.

C. Floors in spaces with drains shall be sloped evenly to drains.

D. Interior base corners shall be coved; external base corners shall be bullnosed.

E. Surfaces to receive setting beds shall be clean and free of oily or waxy films.

F. Tile shall be ground and fitted carefully at intersections, against trim finish, and built-in fixtures. Closely fit around outlets and pipes so plates and escutcheons shall cover-up cuts.

G. A thin layer of dry Portland cement shall be dusted over setting bed and immediately worked lightly with trowel or brush until damp. Tile shall be beat into mortar to slope required. Surface shall be smooth and uniform.

H. After tile has set, grout shall be forced into joints with trowel, squeeze, or finger.

I. Before grout sets, joints of cushion edged tile shall be struck or tooled to depth of cushion.

J. Curing: Waterproof paper shall be laid over tile as soon as grouting is complete and shall remain for three days.

K. Tile shall be thoroughly sponged and washed with clear water after grout has set.

L. Cracked, chipped and out of place tile units shall be removed.

SECTION 9D

LATHING, PLASTER, STUCCO

1. GENERAL:

A. Temperature:

(1) Exterior stucco work: Minimum temperature shall be 55° F. and rising.

(2) Interior plaster work: Maintain a uniform range above 55° F. This range shall be acquired at least 72 hours prior to commencing plaster work and shall be maintained during plastering and setting periods.

B. Ventilation shall be provided to allow for proper curing of plaster.

C. Delivery and storage: Materials shall be in manufacturer's original containers and protected from damage by moisture.

D. Finish:

(1) Keene's cement plaster shall have a smooth trowel white finish.

(2) Stucco shall have a wood floated sand textured finish.

2. PRODUCTS:

A. Metals:

(1) Lath shall be diamond mesh lath, galvanized, 3.4 lbs. per sq. yd.

(2) Casing beads shall be 24 gauge galvanized steel, square edge with expanded flange.

(3) Corner beads shall be 26 gauge galvanized steel, 1/8" rounded nose and expanded flange.

(4) Expansion joints shall be 26 gauge galvanized steel, "W" type with expanded flange.

(5) Cornerites shall be 3" x 3", copper alloy steel, coated with rust inhibitive primer, weighing not less than 2.5 lbs. per sq. yd.

(6) Furring channels shall be 16 gauge, 3/4" cold rolled steel.

(7) Main runners shall be 16 gauge, 1-1/2", cold rolled steel channels weighing not less than 475 lbs. per 1000 lineal feet.

(8) Hanging wire shall be 9 gauge galvanized wire.

(9) Tie wire:
(a) 16 gauge galvanized for tieing furring channels to main runners.
(b) 18 gauge galvanized for tieing metal lath to furring channels.

(10) Manufacturers of metal products:
- (a) Inland-Ryerson Construction Products Co. (Milcor)
- (b) National Gypsum Co.
- (c) U. S. Gypsum Co.
- (d) Penn Metal Co.
- (e) Bostwick Steel Lath Co.

B. Plaster and stucco ingredients:

(1) Hydrated lime: Pressure-type, ASTM C-206-49, Type S
(2) Sand: ASTM C-35. For exterior stucco sand shall be White.
(3) Gypsum plaster: ASTM C-28
(4) Portland cement: ASTM C-150, Type II. For exterior stucco cement shall be white, for finish coat, gray for scratch and brown coats.
(5) Keene's cement: ASTM C-61-64.
(6) Water shall be drinkable and free from excess alkalies, minerals or organic substances.
(7) Manufacturers:
- (a) National Gypsum Co.
- (b) U. S. Gypsum Co.
- (c) Georgia Pacific (Gypsum Division).

3. EXECUTION:

A. Framework and lathing at stucco soffits and suspended plaster ceiling:

(1) Space 1-1/2" main runner at 4' o.c. Tie to structural members of roof at 3' o.c. with No. 9 gauge hanging wire.

(2) At right angles to main runners, space 3/4" furring channels at 16" o.c. Secure with 2 loop of 16 gauge galvanized wire.

(3) With long dimension of lath across 3/4" furring channel secure to furring channels at 6" o.c. with No. 18 gauge galvanized wire. Side laps shall be 1/2". End laps shall be 1" made over furring.

B. Mixes:

(1) Stucco: All three coats shall be 1 part Portland cement to 3 parts sand. Hydrated lime in the maximum portion 10% by weight or 25% by volume may be added.

(2) Gypsum plaster - sanded: (Base coat for Keene cement)
- (a) Scratch coat: 100:2.
- (b) Brown coat: 100:3.
- (c) Finish coat: 1 part Keene's cement, 1 part finishing lime.

C. Application:

(1) Stucco shall be 3 coats on metal lath. Thickness 3/4".

(2) Gypsum plaster sanded shall be 3 coats on metal lath. Thickness 3/4".

(3) Surfaces to receive stucco or plaster shall be cleaned of rust and foreign matter.

(4) Gypsum plaster:

(a) Scratch coat shall be applied with sufficient material and pressure to form good bond with lath. Allow coat to partially set, cross scratch, and allow to set firm and hard.

(b) Brown coat shall be applied up to plaster screed and shall be rodded, screeded, and floated with all angles straight and plumb. Leave rough to receive finish coat.

(c) Finish coat (Keene cement) shall be applied to partially dry brown coat which has set firm and hard. Trowel finishes shall be water troweled during and after set to provide smooth dense surface.

(5) Stucco:

(a) Scratch coat shall be applied with sufficient material and pressure to form good bond with lath. Thickness 3/8", Cross scratch.

(b) Brown coat shall be applied when scratch coat has partially set and can carry weight of both coats. Thickness 1/4". Screed and rod surface to bring to a plumb and level plane. Surface shall be floated. Moist cure for 48 hours and allow to dry for 5 days before application of finish coat.

(c) Finish coat: Prior to application uniformly dampen brown coat to obtain uniform suction. Apply finish coat in an 1/8" thickness. After 1 day moist cure surface by fog spray for 1 day.

(d) Expansion joints shall be provided at a maximum of 10' o.c. or as indicated.

(6) Metal accessories: Provide as follows and as indicated on drawings:

(a) Corner beads: Provide at exterior plaster and stucco corners.
(b) Casing beads: Provide where plaster and stucco abuts other materials.
(c) Cornerites: Provide at interior corners where plaster intersects another plane.

SECTION 9E

PAINTING

1. GENERAL:

A. Color samples: Samples of each finished color shall be applied in applicable spaces. Obtain Architect's approval of samples before commencing painting of the surfaces. Submit 2 - 12" x 12" samples of natural finish wood for cabinetwork.

B. Delivery and storage:

(1) Materials shall be delivered to site in quantities to eliminate delay and shall be contained in manufacturer's original cartons with labels intact and seals unbroken.

(2) Materials shall be stored to prevent contamination by foreign liquids or substances.

(3) Precautions shall be taken to prevent a build-up of oily rags and waste to avoid danger from fire.

C. Temperature: During painting and drying operations, the temperature shall be 50° or above.

D. Priming: On factory primed items, prime coat shall be omitted except to restore original primed finish.

E. Cleaning: Areas to be painted shall be broom cleaned prior to commencing painting operation. After painting has started, broom cleaning will not be permitted in areas being painted.

F. Light shall be provided in areas being painted.

G. Upon completion surfaces damaged shall be touched-up and restored.

2. PRODUCTS:

A. General: Undercoats and finish coats shall be of the same manufacturers.

B. Manufacturers:

(1) Sherwin-Williams Co. (S.-W.)
(2) Glidden Paint Co. (G)
(3) Martin-Senour Co. (M-S)
(4) Benjamin Moore (B.-M.)

C. Exterior:
(1) Ferrous Metals:
One coat:
(S-W) E41N1 Kromik Metal Primer

(G) 4570 Metal Primer
(M-S) KI3W5 Wrought Iron Flat White
(B-M) Iron Clad Retardo Rust Inhibitive Paint

Two Coats:
(S-W) B46 Series Exterior Gloss
(G) Spred Gel-Flo
(M-S) Monarch Gloss House Paint
(B-M) Impervo Enamel Gloss

(2) Galvanized metals:

One Coat:
(S-W) B50A1 Galvanized Iron Primer
(G) 5229 Galvanized Iron Primer
(M-S) KI3W5 Wrought Iron Flat White
(B-M) Iron Clad Galvanized Metal Primer

Two Coats:
(S-W) Gloss Exterior Building Paint
(G) Spred Gel-Flo Exterior Alkyd
(M-S) Monarch Gloss House Paint
(B-M) Impervo Enamel Gloss

D. Interior:

(1) Ferrous metals

One coat:
(S-W) E4INI Kromik Metal Primer
(G) 4570 Metal Primer
(M-S) KI3WF Wrought Iron Flat White
(B-M) Alkyd Enamel Underbody

Two Coats:
(S-W) B82 Series Hi-hide Semi-Gloss
(G) 4600 Spred Lustre Semi-Gloss
(M-S) Gloss-Tone Satin Gloss
(B-M) Alkyd Dulamel

(2) Galvanized metals:

One coat:
(S-W) B50A1 Galvanized Iron Primer
(G) 5229 Galvanized Iron Primer
(M-S) KI3WF Wrought Iron Flat White
(B-M) Iron Clad Galvanized Metal Primer

Two Coats:
(S-W) B82 Series Hi-hide Semi-Gloss
(G) 4600 Spred Lustre Semi-Gloss
(M-S) Gloss-Tone Satin Gloss
(B-M) Alkyd Dulamel

(3) Concrete masonry:

One Coat:
(S-W) Block-Tex
(G) 581W08101 Latex Block Filler
(M-S) 2672 Block Filler
(B-M) Fill-Coat Block Filler

One Coat:
(S-W) B45 Series Quali-Kote Latex
(G) Ultra-hide Latex
(M-S) Poly-Flow
(B-M) Regal Wall Satin

One Coat:
(S-W) B47W9 Gloss Alkyd Enamel
(G) Spred Gloss Enamel Alkyd
(M-S) 897 Gloss-Tone Satin Gloss
(B-M) Impervo Enamel

(4) Keene Cement Plaster and gypsum board
One Coat:
(S-W) B49WI Wall Primer Sealer
(G) 3416 Spred Primer Sealer
(M-S) 2633 Pigmented Primer and Sealer
(B-M) Latex Quick Dry Prime Seal
Two Coats:
(S-W) B82 Series Hi-hide Semi-Gloss
(G) 4600 Spred Lustre Semi Gloss
(M-S) Gloss-Tone Satin Gloss
(B-M) Alkyd Dulamel

(5) Wood (Painted)
One coat:
(S-W) B49W2 Enamel Undercoater
(G) 555 Enamel Undercoater
(M-S) 2660 Enamel Undercoat
(B-M) Alkyd Enamel Underbody
Two Coats:
(S-W) B82 Series Hi-hide Semi-Gloss
(G) 4600 Spred Lustre Semi-Gloss
(M-S) Gloss-Tone Satin Gloss
(B-M) Alkyd Dulamel

(6) Wood (Stain finish):
One coat:
(S-W) A48 Interior Stain
(G) Spred Latex Wood Stain
(M-S) Neu-Stain
(B-M) Benwood Stain

One Coat:
(S-W) AG7V1 Marvethane Gloss
(G) Hi-Gloss Polyurethane 20
(M-S) 08075 Astro-Var Clear Gloss
(B-M) Movar Urethane Gloss

One Coat:
(S-W) A67F1 Marvethane Satin
(G) Satin Polyurethane 10
(M-S) 08071 Astro-Var Satin Gloss
(B-M) Movar Urethane LoLustre

3. EXECUTION:

A. Inspection of surfaces: Prior to beginning work, surfaces to receive finishes shall be examined for defects. Surface defects shall be corrected.

B. Preparation of surfaces:

(1) All surfaces to receive finishes shall be dry and clean.

(2) Concrete block surfaces shall be pointed-up and free from loose joints, mortar, smears, and splatter. All surfaces to dry a minimum of 30 days after being laid.

(3) Wood surfaces shall be sanded to a smooth and even surface. Before primer coat,touch-up knots, pitch streaks, and resimous sapwood with shellac, four lb. cut. After prime coat has dried fill nail holes, cracks, and open joints with putty. Colored for stained wood or 10% white putty for painted surfaces.

(4) Gypsum board surfaces: Fill holes and minor irregularities with spackling compound and carefully sand to a smooth finish.

(5) Ferrous surfaces: Remove dirt and grease with mineral spirits, wiping dry with clean cloths. Rust, mill scales, and defective primer paints shall be removed to bare metal. Restore surface with specified primer.

(6) Galvanized surfaces: Remove dirt, and grease with mineral spirits and wipe dry with clean cloth.

(7) Plaster surfaces: Fill cracks and holes with patching plaster. Do not use sandpaper on plaster to be painted. Before painting, plaster surfaces shall be tested for moisture content. Moisture content shall be less than 20% before applying paint or sealer.

(8) Efflorescense shall be removed with a solution of one part commercial muratic acid to five parts water. Rinse with clean water.

C. Application:

(1) Proportions of all ingredients inpaints and stains mixed on the site shall be in accordance with the recommendations of the paint manufacturer printed on the containers applicable to the use for which the specific mixture is intended.

(2) Screen out all lumps during mixing. Use clean containers and protect against dirt or trash entering the paint. Paint shall be stirred to a uniform consistency.

(3) Priming coats, undercoats, and block filler shall be tinted to the approximate shades of the final coat.

(4) Exterior painting shall not be performed in damp, rainy, or frosty weather or until the surface has dried from effects of such weather.

(5) Spraying will not be permitted.

(6) Tops, bottoms and sides of wood and metal doors shall be finished same as the faces.

(7) Surfaces to be stained or painted shall be clean, dry, and smooth. Each coat of paint shall be smoothly applied, worked out to even finish, and allowed to dry before next coat is applied.

(8) Finished work shall be uniform and of the specified color. Coverage shall be completely free from runs, sags, or excessive flooding. Edges of painted surfaces adjoining other materials shall be sharp, straight, and without overlaps.

(9) Painting will not be required on walls behind lockers, permanently attached base and wall cabinets with closed backs, chalkboards, and tackboards.

(10) Interior of all cabinetwork shall be finished same as exterior.

(11) Ferrous and galvanized metals exposed on exterior shall be painted.

(12) Handrails and underground gas tank vent pipe shall be painted.

(13) Supporting angles for overhead door track shall be painted.

(14) Shelving in spaces 103, 107, 113, 116, 117, 121, 126, 127, 003, 005, 006, 008, 017, 019, 023, 024.

SECTION 9F

VINYL BASE

1. GENERAL:

   A. Submittal: Furnish 3 samples of color of material used.

   B. Delivery: Deliver materials to job in manufacturer's unopened containers bearing name, color and pattern marked thereon.

   C. Storage: Materials shall be stored in original containers in an area in which the temperature is not less than 40° F.

   D. Temperature requirements:

      (1) For a minimum of 48 hours prior to commencing installation, the area where the base is stored shall be maintained at a minimum of 60° F.

      (2) For a minimum of 48 hours prior to commencing installation, during installation and a minimum of 48 hours after installation, spaces shall be maintained at a minimum of 60° F. After this period, maintain a temperature of 50° F. minimum.

2. PRODUCTS:

   A. Vinyl base: 1/8 inch thick, coved, 4 inch high, set on type. Provide premoulded exterior corner units. Color to be selected by Architect.

      (1) Manufacturers:
         (a) Armstrong Cork Co.
         (b) Mercer Plastics Co.
         (c) Flintkote
         (d) GAF Corp.
         (e) Johnson Rubber Co.

   B. Adhesive: Type approved by manufacturer of base.

3. EXECUTION:

   A. Base shall be securely installed to the concrete masonry at locations indicated.

   B. Base will not be required behind base cabinets and metal lockers.

SECTION 9G

SPECIAL COATING

1. GENERAL:

   A. Submittal: Furnish 2 24" x 24" samples on cement asbestos board showing color and texture.

   B. Protection: Upon completion surface shall be protected from abrasions and foreign matter.

   C. Damaged areas of coatings shall be recoated.

   D. Temperature shall be 40 degrees or above before and at least 24 hours after application.

   E. Moisture content in wall shall be less than 17%.

2. PRODUCTS:

   A. Special coating shall be an acrylic based textured coating.

      (1) Textone by Cota Industries
      (2) Vitritone by Vitricon Inc.

   B. Special Coating shall be color tinted to match natural limestone.

3. EXECUTION:

   A. Special coating shall be applied to precast concrete panels and concrete retaining wall. Coating shall cover all areas exposed to view after final installation of flashing and masonry.

   B. Special coating shall be applied by applicator certified by manufacturer.

   C. Surface to receive coating shall be free of grease, oil,mortar splatters and dirt.

   D. Special coating shall be applied prior to caulking of joints in precast concrete panels.

   E. Application sequence:

      (1) Sealer coat
      (2) Texture coat (sand finish)
      (3) Clear acrylic sealer (flat sheen)

SECTION 9H

CARPET

1. The Contractor shall include in his Base Bid an allowance of seventeen dollars ($17.00) per square yard including sales tax, installation of carpet, pads and accessories for spaces indicated in the finish schedule.

2. The Owner and Architect shall select the carpet, pad and accessories and any amount expended which is less than the allowance shall be deducted from the contract price by change order.

3. As soon as practical after the construction begins, the Contractor shall furnish the Architect with the quantity of carpet in square yards that will be required for a complete installation.

SECTION 9I

FIREPROOFING

1. GENERAL:

   A. Submittal: Furnish 5 copies of manufacturer's instructions for installation of fireproofing.

   B. Temperature: Fireproofing shall not be applied when the space temperature is below 50 degrees F.

   C. Storage: Materials shall be stored off the ground, under cover, and away from damp areas.

   D. Delivery: Materials shall be mill-mixed and delivered in original, unopened packages bearing manufacturer's name and the U.L. label.

2. PRODUCTS:

   A. Fireproofing shall be plaster cementitious setting-type tested by Underwriters Laboratories, Inc., in accordance with ASTM E-119.

3. EXECUTION:

   A. Fireproofing shall be applied in spaces and on surfaces indicated to provide fire rating listed below:

      (1) Metal deck and bar joist covered with metal lath in space 016, 104 and 114, 2 hour rating.

   B. Upon completion the manufacturer shall provide a certification co-signed by applicator indicating fire rating achieved in specified areas.

   C. Application shall be in accordance with the written instructions of the material manufacturer.

   D. All surfaces to be fireproofed shall be cleaned of oil, grease, dirt, loose paint, and mill scales.

   E. After application of fireproofing, walls, floors, and adjacent equipment shall be cleaned of fireproofing deposits.

   F. Application of sprayed fireproofing to the underside of the metal deck shall occur only after construction traffic has ceased.

   G. Provisions shall be made for natural or mechanical ventilation of affected spaces to properly dry the fireproofing during and subsequent to its application.

SECTION 10A

TOILET COMPARTMENTS, TOILET ACCESSORIES

1. GENERAL:

A. Submittals: Furnish 5 copies of shop drawings of toilet and shower compartments and 5 copies of catalog cuts of toilet accessories. Indicate material gauges, finishes, construction, anchorage, and lay-outs.

B. Protection: Compartment panels and accessories shall be stored to protect against surface abrasions and distortions.

C. Toilet accessories shall be of one manufacturer.

2. PRODUCTS:

A. Toilet compartments and urinal screen shall be laminated plastic faced, overhead braced (floor braced urinal screen). Doors, pilasters, wall posts, and panels shall have a minimum finished thickness of 1 inch.

(1) Construction: Doors, pilasters, wall posts, and panels shall be 3 ply resin impregnated wood. Pilasters shall have jack screws type leveling base with steel bar concealed by a Type 302 stainless steel, satin finish plinth.

(2) Hardware and fittings shall be that standard with the manufacturer. Hinges shall be adjustable to hold door of unoccupied compartment in ajar position. Door latch shall be slide bolt type. All hardware shall be installed with vandal-proof full thread screws. Provide coat hook and bumper on each door.

(3) Finish all faces and edges of compartments shall be matte finish high pressure laminated plastic.

(4) Manufacturers:
(a) Embassy by Global Steel Products Corp.
(b) Type B Overhead Braced w/Type A Stile Base Assembly by Mid-South Manufacturing Co.
(c) Type T-R4-P w/TR4-P GOV. Pilaster Assembly by Tansey Co.
(d) Overhead braced type w/floor mounted base assembly by Ampco Products.
(e) Hi-Stile, Weisheild with Floor braced base assembly by Henry Weis Mfg. Co.

B. Toilet accessories:
(1) Toilet paper holder (one per water closet):
(a) No. 263 by Accessory Specialties, Inc.
(b) No. 507 by Bradley Washfountain Co.
(c) No. 202 by Charles Parker

(2) Mirrors (Spaces 122, 011, 012, 014)
(a) No. 600 - 24 x 30 by Accessory Specialties, Inc.
(b) No. 700 - 24 x 30 by Bradley Washfountain Co.
(c) No. 3020 - 24 x 30 by Charles Parker.

(3) Mirrors w/5" s.s. shelf (one per lavatory in space 109 and space 203):
(a) No. 605 - 16 x 20 by Accessory Specialties, Inc.
(b) No. 705 - 16 x 20 by Bradley Washfountain Co.
(c) No. 52010 - 16 x 20 by Charles Parker.

(4) Mop and Broom Holders (1 - Space 113, 104, 016):
(a) No. 796-C w/5 holders by Accessory Specialties, Inc.
(b) No. 995-5 by Bradley Washfountain Co.
(c) No. 608-5 by Charles Parker Co.

(5) Grab bars (one each side of stall - space 122,011,012,014):
(a) Type T-24 series 3200P, 1-1/2 inches x 48 inches and 24 inches by Accessory Specialties, Inc.
(b) No. 812-003-2, 48 inches and 24inches by Bradley Washfountain Co.
(c) No. 825S type 24CN - 48 inches and 24 inches by Charles Parker.

(6) Paper towel holder (1 each space 113 and 122, 011, 012, 014):
(a) No. 230 by Accessory Specialties Co.
(b) No. 250 by Bradley Washfountain Co.
(c) No. 0700 by Charles Parker Co.

(7) Towel hook (7-space 109, 2 - space 110, 1-space 203):
(a) No. 750 by Accessory Specialties Inc.
(b) No. 913 by Bradley Washfountain Co.
(c) No. 667 by Charles Parker Co.

(8) Napkin disposal (one in space 012):
(a) No. 852 by Accessory Specialties, Inc.
(b) No. 478 by Bradley Washfountain Co.
(c) No. 606SM by Charles Parker

C. Shower enclosure shall be bi-fold type with grill at top. Unit shall be 11 gauge polished aluminum with Translucent safety glass.
(1) Manufacturers:
(a) Model 8A by G. M. Ketcham Co., Inc.
(b) Products by Peachtree Shower Door Co. and Shower Door Co. of America are acceptable.

3. EXECUTION:

A. Toilet compartments shall be installed rigid, plumb, and level. Adjust doors to stand 4 inches ajar while not in use. Two 3/8 inch over bolts in lead expansion shields shall be provided in concrete slab (not the setting bed of tile) to receive leveling plates of each pilaster.

B. Toilet accessories shall be installed at locations indicated. Installation shall be in accordance with the manufacturer's instructions accompanying each item of equipment. Exposed fasteners shall be tamperproof.

C. Shower enclosure shall be closely fitted in opens and securely fastened. Frame shall be set in bed on exterior caulk.

SECTION 10B

FIRE EXTINGUISHERS

1. GENERAL:

   A. Submittal: Furnish 5 copies of catalog cuts for units used.

   B. Provide at locations indicated.

   C. Units shall be U/L approved.

2. PRODUCTS:

   A. Fire extinguishers shall be Class ABC, 10 lb. type, dry chemical with indicating gauge.

      (1) No. 10ABC by Elkhart Brass Manufacturing Co.
      (2) No. 10, Cosmic Series A byJ.L. Industries.
      (3) ABC 10 by Seco Manufacturing Co.
      (4) ABC 10 by Potter-Roemer, Inc.
      (5) TGPA-10A Triplex by General Fire Extinguishers.
      (6) No. 10 ABC by Amerex Corp.
      (7) No. A10A by American LaFrance.

3. EXECUTION:

   A. Hanging brackets shall be mounted with toggle bolts. Height shall by 5 feet 4 inches.

SECTION 10C

METAL LOCKERS

1. GENERAL:

A. Submittal: Furnish 5 copies of shop drawings showing sizes, material gauges, hardware, construction, and accessories.

B. Color: To be selected by Architect from standard and optional colors.

2. PRODUCTS:

A. Metal lockers shall be 15 inches wide x 18 inches deep x 36 inches high, double tier type, without legs (units to be recessed).

(1) Handle: Latching lift with integral padlock attachment, chrome plated. Locking device shall be prelocking so mechanism can be locked in open position, door locking automatically when closed.

(2) Body: 24 gauge steel flanged to give double thickness of metal at back vertical corners.

(3) Door frame: 16 gauge formed steel channels.

(4) Door: One piece, 16 gauge steel, with 6 inch louver at top and bottom of door.

(5) Coat hooks: 4 singleprong hooks and 1 double prong ceiling hook. Hooks shall be rust-proof steel with ball points. Attach with 2 bolts.

(6) Finish shall be baked on enamel.

(7) Number plates shall be aluminum with 3/8 inch high figures, mounted at top of door. Odd numbers on top row; even numbers on bottom row. Start adjacent to door no. 9 with top row 1 (odd numbers), bottom row 2 (even numbers), proceeding clockwise in space.

(8) Manufacturers:
(a) Lyons Metal Products, Inc.
(b) Interior Steel Equipment Co.
(c) Republic Steel Corp.
(d) Penco Products, Inc.

3. EXECUTION:

A. Metal lockers shall be installed as detailed.

B. Anchors back of every fourth top unit to wall with 1/4" diameter bolts.

SECTION 10D

CHALKBOARDS, TACKBOARDS

1. GENERAL:

   A. Submittal: Furnish 5 copies of shop drawings indicating size, quantity, layouts, material, trim and accessories.

   B. Protection: Units shall be stored so as to protect frames and board surfaces from damage.

2. PRODUCTS:

   A. Chalkboards (ready framed in single lengths to 12 feet):

      (1) Ceramo-steel, blue-green color, 24 gauge steel face, 3/8 inch particle board core with aluminum foil back by Gotham Educational Equipment Co.
      (2) Vitracite, clearsite green, no. 19, 24 gauge steel face, 3/8 inch particle board core, with aluminum foil back by Claridge Products and Equipment, Inc.
      (3) Korok, G-7 green, 22 gauge steel face, 3/8 inch particle core, with aluminum foil back by Greensteel-Korok, Inc.
      (4) Provide hang bars and adjustable clips.

   B. Tackboards (ready framed in single lengths to 12 feet):

      (1) Color cork, tan, 1/4 inch thick, burlap backing mounted on 1/4 inch hardboard backing by Gotham Educational Equipment Co.
      (2) Cork bulletin board, no. 38A-Natural, 1/4 inch thick mounted on 1/4 inch hardboard backing by Claridge Products and Equipment Co.
      (3) Cork Tac-Tex, G10 Tan, 1/4 inch thick mounted on 1/4 inch fibreboard backing by Greensteel-Korok, Inc.
      (4) Provide hanging bar and adjustable clips.

   C. Trim (extruded aluminum with clear anodized satin finish):

      (1) Deluxe, Series A with No. 5 chalk tray by Gotham Educational Equipment Co.
      (2) Series 185, with no. 271 chalk trough by Claridge Products and Equipment Co.
      (3) AX Series with No. 52K chalk trough by Greensteel-Korok, Inc.
      (4) Trim at Tackboards same, omit chalk trough.
      (5) Provide end caps on chalk troughs.

   D. Accessories: 2 roller brackets and 4 hooks w/clips with each chalkboard.

      (1) 2-No. MR- 1 and 4 - No. CMH-1 by Gotham Educational Equipment Co.
      (2) 2 - No. 51RB and 4 - No. 51C by Claridge Products and Equipment Co.
      (3) 2 - No. 3400 K and 4 - No. 8100 K by Greensteel - Korok, Inc.

3. EXECUTION:

   A. Provide 4" wide plywood vertical shim strips (full height) behind chalkboards and tackboards at 16" o.c. Attach to masonry with adhesive.

3. EXECUTION:

A. Units shall be installed level.

B. Hanging clips shall be attached to masonry with 1/4" diameter toggle bolts.

C. Adjustable clips shall be installed at 24" o.c. with 1/4" diameter toggle bolts.

D. Chalkboards shall be mounted with top of chalk try 33" above finished floor.

E. Tackboards shall be mounted with bottom of frame 33" above finished floor.

SECTION 10E

METAL FILES

1. GENERAL:

   A. Submittals: Provide 5 copies of descriptive literature for approval.

   B. Protection: Contractor shall protect equipment from damage.

2. PRODUCTS:

   A. Two drawer, letter type w/lock, size 14-7/8 w x 27-1/2 h x 30 d.
      (1) No. 1776L, Color Tan valve 5 by Steelcase.
      (2) Products by Shaw-Walker and General Fireproofing are acceptable.

3. EXECUTION:

   A. Two drawer units shall be installed as follows:
      (1) Space 125 - 3
      (2) Space 010 - 3

SECTION 10F

OVERHEAD DOOR

1. GENERAL:

   A. Submittals: Furnish 5 copies of shop drawings, dimensioned and indicating installation details, material gauges, finish and hardware. Provide control diagram for electric operators.

   B. Storage: Units shall be stored so as to protect against distortion in frames and surface abrasions.

2. PRODUCTS:

   A. Overhead doors shall be aluminum sectional upward-acting. Size as shown on drawings.

   B. Stiles and Rails shall be extruded aluminum alloy no. 6063T6. Nominal thickness 1-3/4". Doors shall be constructed with 3 center stiles and 8 sections. Rails and stiles shall be secured with through-rods.

      (1) Top rail - Minimum 3-3/4 inches
      (2) Bottom rail - Minimum 3-3/4 inches
      (3) Intermediate Rail - Minimum 3-1/8 inches per pair
      (4) End stile - Minimum 3-1/2 inches
      (5) Center stiles - Minimum 2-5/8 inches

   C. Aluminum panels shall be anodized minimum .04 inches thick. Provide in bottom sections of all doors. Panels shall be secured with rigid vinyl moulds to form a watertight seal.

   D. Hardware shall be cadmium plated.
      (1) Hinges shall be full floating hardened ball bearing rollers and roller stems.

      (2) Lock shall be cadmium plated single unit mechanism without lock cylinder, right side installation, inside handle only for inside operation.

   E. Tracks shall be standard 2" type hot dipped galvanized steel.

   F. Counter balance shall be front mounted torsion spring on cross header shaft. Drums shall be tapered. Lift cables shall be galvanized. Door shall be equipped with wedge type opening and closing action. Provide nylon pull rope.

   G. Vinyl weather stripping shall be provided for sealing bottom of doors. Extend weatherstripping full width of door.

   H. Glass: Doors shall be prepared for 3/16" thick acrylic sheet. Glazing shall be provided under Section 8E.

I. Electric operator shall be draw bar type, 1/3 hp. 120 volt power unit with instant reversing, single phase, with capacitor starting. Unit shall have adjustable friction clutch and brake system.

J. Door linkage shall be steel arm and spring cushion, automatically locks door when door is closed and can be disconnected by hand and reconnected without tools.

K. Pneumatic safety switch shall be provided at bottom of doors. Control conductor from safety switch shall be housed in automatic take up reel.

L. Push buttons shall be provided and installed under Section 16. Disconnects at motor controllers, conductors and connection of conductors to wall switches and motor controls shall be by door manufacturer.

M. Manufacturers:
(1) Model 520 by Overhead Door Co.
(2) Model 520 by Crawford Door Co.

3. EXECUTION:

A. Installation of doors and associated equipment shall be in strict accordance with the manufacturer's written instructions, a copy of which shall be present on the job during installation. Before final acceptance, the Contractor shall provide a certificate of the manufacturer on the letterhead of the manufacturer, in which the manufacturer certifies that the doors, tracks, electric operator, and associated equipment has been installed in strict compliance with the manufacturer's recommendations and are operating properly.

B. Tracks and electric operator shall be secured to roof structural framing with support angles neatly aligned and attached by welding.

SECTION 10G

KITCHEN EQUIPMENT

1. GENERAL:

   A. Submittals:

      (1) Refrigeration, cooks table, pot sink and range: Furnish 5 copies of catalog cuts showing dimensions, capacities, etc.

      (2) Range hood protection system: Furnish 5 copies of shop drawings indicating model, capacity controls and piping arrangement.

      (3) Range hood: Furnish 5 copies of shop drawings indicating layout, metal gauges, dimensions, filters and filter framework.

   B. Protection: Equipment shall be protected from abrasions and damage.

2. PRODUCTS:

   A. Refrigerator (Color-White) (See large scale plan for door swing of each unit).
      (1) 2 - TBF - 21 DV by General Electric
      (2) 2 - FPCI - 206T by Frigidaire

   B. Range shall be gas restaurant type with standard gray enamel finish. Top shall consist of 10 open burners. Unit shall have 2 ovens with automatic lighting and 100% safety shut-off. Furnish one rack per oven. Unit shall have low backsplash without shelf.

      (1) Model 60L - 70R by Vulcan-Hart Corp.
      (2) Products by South Bend acceptable.

   C. Range Hood protection system shall be R 101-10-1 Dry Chemical by Ansul Co. Provide as follows:

      (1) Self-closing nozzles (1 duct, 2 plenum, 2 over range top).
      (2) 1/2" conduit detector piping
      (3) Automatic detection system.
      (4) Dry chemical piping (Schedule 40 standard weight), hot dipped.
      (5) Dry chemical storage chamber.
      (6) CO_2 cartridge.
      (7) Automatic gas fuel shut-off.
      (8) Unit shall be Underwriters' Laboratories approved.
      (9) Protection system Model ARS-10 by Safety First Products Corp. is acceptable.

   D. Range Hood:

      (1) Metal Hood: 18 gauge stainless steel
      (2) Grease filters: 20" x 25" x 2", permanent, cleanable type with galvanized steel frame. Filter media shall be galvanized metal.

         (a) Air San
         (b) American Air Filter
         (c) Farr Co.

E. Cooks table - 2'-6" x 6'-0" x 2'-10" high. All four sides shall have 1-1/2" bull nose roll. Provide undershelf and two drawers. Provide table mounted pot rack, 5'-0" x 2'-0". Pot rack shall be three bar type, fabricated of 2" x 1/4" wrought iron, hammertone grey finish, fitted with 12 double point cadimum plated sliding type pot hooks. Outside bar shall have rounded ends. Center bar shall be located approximately 10" below outer bars. Attach pot rack to table top with two 1-5/8" galvanized pipe in stainless steel gussets welded integrally with table top. Unit shall be 60" above table top. Top shall be 14 ga. stainless steel, one piece seamless construction. Drawers shall be 18 ga. galvanized with all corners coved, mounted on double roller bearing channel slides. Face of drawers shall be 18 ga. stainless steel with integral recessed handles. Drawers shall be 20" x 20" x 5". Undershelf shall be 18 gauge stainless steel. Legs shall be 1-5/8" O.D. electroplated steel, attached to enclosed stainless steel gussets with set screws. Gussets shall be welded to reinforced channel braces on underside of top. Feet shall be sanitary adjustable bullet type white metal. Unit shall meet NSF standards.

F. Pot sink - 1- 24x24 compartment, 1- 24x30" compartment and 24" drainboard at right end. Compartment shall be 14" deep except 10kw heater with thermostat control and low water cut-off mounted and prewired shall be installed in 18" deep, 24"x30" compartment. Housing shall have perforated stainless steel removeable guard. Heating element shall be 208-60-3 phase. Sink and drainboard shall be 14 gauge stainless steel with 8" high integral backsplash turned back 2" on a 45 degree angle. Sinks shall be all welded, water tight having integrally rolled rims in front and sides. Splashback shall be drilled 8" on centers to accommodate standard faucets. Bottom of each compartment shall be scored toward waste outlet. Each compartment shall be provided with Atlantic Brass Works lever operated waste and tailpiece attached to sink in such a manner to eliminate the use of rivets. The sink shall be of integral construction with the drainboard. Provide 34" setting height from floor to work level. Legs shall be 1-5/8" O.D. electroplated steel, attached to enclosed stainless steel gusset. Feet shall be sanitary adjustable bullet type of white metal.

3. EXECUTION:

A. Range hood protection system:

(1) Control box shall be located as indicated. Horizontal piping from control box to hood shall be concealed above ceiling.

(2) System shall be wired and installed ready for operation.

(3) Piping in duct shall be supported by 1" wide, 16 gauge, galvanized steel strap.

(4) Piping exposed under hood shall be supported with min. 1/4 inch diameter steel rods and standard pipe supports.

B. Range Hood:

(1) Construct hoods size and shape as indicated.

(2) Joints shall be continuously welded and smooth.

SECTION 10H

MISCELLANEOUS EQUIPMENT

1. GENERAL:

A. Submittal: Furnish 5 copies of shop drawings for each item indicating dimensions and installation details.

2. PRODUCTS:

A. Flagpole: Flagpole shall be cone tapered, ground set flagpole of seamless cold drawn 6063-T6 aluminum tubing with 3/16" wall, without visible joints. Furnish with 14 gauge aluminum ball stain-brush finished and waxed; B-D ball bearing aluminum, non-fouling revolving top, double sheave; continuous braided cord halyard with invisible connectors; swivel flag snaps and aluminum cleat; 16 gauge corrugated foundation tube with self-centering bottom plate and lightening protector ground spike. Exposed height of pole shall be 30 feet, total length 33 feet. Outside diameter of top - 3-1/2 inches, outside diameter of butt 5-1/2 inches, ball 6 inches. Portion of pole in ground shall be shop painted with black asphaltum inside and outside. Concrete footing shall be 4 feet deep. Diameter of concrete footing shall be 30 inches. (Slope top of concrete away from pole in all directions.) Provide 6 x 6 - 10/10 WWM vertical reinforcement 3 inches from perimeter of outside footing wall.

(1) Products by American Flagpole, Baartol Co., Concord Industries, Morgan-Francis Co. and Babcock-Davis Associates, Inc., are acceptable.

B. Coat racks shall be model PA26 with silver acrylic finished hooks as manufactured by Vogel-Peterson Co.
(1) 18" unit with 4 hooks in space 017.
(2) 34" unit with 6 hooks in space 010.

C. Clothes washer: (Color: White)
(1) Model WID by Frigidaire
(2) Model WWA 7400 by General Electric

D. Clothes Dryer: (Color: White) (Electric)
(1) Model DEI by Frigidaire
(2) Model DDE 7108 by General Electric

E. Metal letters shall be Andco Industries Corp. cast aluminum alloy with natural satin finish (Type C). Mounting shall be type FMC-2. Style shall be Futura 444, 6 inch high, 1 inch deep, 1-1/8 inch stroke and average width of 5 inches. Arrangement of letters shall be as follows:
(1) South Elevation of Main Level (See Drawing A-8)
Fire Station No. 1
(2) West Elevation of Ground Level (See Drawing A-8)
City of Athens
Fire Department
Headquarters

Products by Southwell Co., Spanger and Meierjohan-Wengler, Inc. are acceptable.

F. Basketball goal and post shall be No. 59 as manufactured by Porter Equipment Co.
   (1) Unit shall consist of double uprights 3-1/2" OD and 2-3/8" OD, heavy wall galvanized pipe. Bank and goal shall be mounted on four foot extension supports of 1-5/8" OD pipe which are diagonally braced with galvanized tension flats. Bank and goal shall be metal.
   (2) Products by Recreation Equipment Corp., Medart and Nissen are acceptable.

G. Volleyball standards and net shall be as manufactured by Porter Equipment Co.
   (1) 2-floor sleeves with cover plate - No. 00730-000.
   (2) Combination standards (one pair with one reel post) - 2-3/8" OD - No. 00731-000.
   (3) Volleyball net standard with manufacturer.
   (4) Products by Recreation Equipment Corp., Medart and Nissen are acceptable.

3. EXECUTION:

A. Flagpole shall be installed in accordance with manufacturer's recommendation and at location indicated on drawing no. A-1.

B. Metal letters shall be installed at location indicated. Letters shall be mounted with threaded rods in holes in masonry. Secure with quick dry cement. Exact height shall be determined by the Architect. Provide full size template before commencement of work.

C. Coat racks shall be provided and installed in spaces indicated. Height shall be determined by Architect. Mounting screws shall be concealed.

D. Clothes washer and dryer shall be installed in space 104. Units shall be leveled and shall operate without vibration.

E. Basketball goal shall be mounted at location indicated on Drawing A-1. Rim of goal shall be set 10' above concrete slab. Post shall be set 3' deep in concrete, 2' in diameter.

F. Volleyball standards and net shall be installed at location indicated and as detailed.

SECTION 15A

PLUMBING

15A.01 SCOPE: This section of specifications covers plumbing systems complete, as shown on the drawings and as specified herein. All systems shall be tested, balanced and made ready for operation.

15A.02 GENERAL:

A. Plans are diagrammatic and show generally the location of piping and accessories and are not to be scaled for construction measurements. All dimensions shall be verified at the building site.

B. Both the drawings and specifications shall be considered supplemental to one another so that materials and labor required by one but not by the other shall be supplied and installed as though specifically called for by both.

C. Exact locations of rough-in connections to all equipment shall be determined before any rough-in is started. All work shall be coordinated with the work of other trades to avoid conflicts.

15A.03 ORDINANCES AND PERMITS:

A. The work covered by this section of specifications shall conform to the 1978 Standard Plumbing Code and all local addenda thereto.

B. The Contractor shall obtain all permits and arrange for inspections for the installation of this work and shall pay all charges incidental thereto. The Contractor shall deliver to the Owner all certificates of said inspections issued by the authorities having jurisdiction.

C. Ordinances, codes, etc. shall govern as to minimum requirements. Equipment, fixtures, materials, installations, etc. shown in specifications and on drawings in excess of those minimum requirements shall be adhered to by the Contractor.

15A.04 UTILITY CONNECTIONS: Provide for all services as shown on drawings. Make all arrangements for connections and tap-ons; pay all associated fees. Provide water pressure reducing valve assembly if water pressure at building entrance exceeds 80 psi.

15A.05 SUBSTITUTIONS:

A. Where equipment is specified herein or on drawings by manufacturer's names or model numbers, this shall denote minimum requirements as to quality, type, capacity, function and performance.

B. Substitutions of specified items will be considered only if written request has been submitted to the Architect/Engineer for approval at least ten days prior to the date for receipt of bid proposals.

Each request shall include a description of the proposed substitute, the name of material or equipment for which it is to be substituted, drawings, cuts, performance and test data and any other data necessary for an evaluation and a statement from the equipment manufacturer's representative that the items to be substituted meet or exceed the specifications of the substituted for.

C. If the substitution is allowed, such approval will be set forth in an addendum. No other substitution shall be allowed. Verbal approval for substitution shall not be valid.

D. See also General Conditions.

15A.06 SHOP DRAWINGS:

A. General: Submit six copies of shop drawings for approval. Contractor shall check data carefully to insure compliance with specifications prior to submitting. Submittals shall be assembled in sets and bound with an index sheet and tabs. Submittal data shall be submitted at one time unless unavailable drawings would delay job progress.

B. Each individual data sheet shall be annotated showing model number, size, color and accessories of each item to be furnished. Also include installation instructions and electrical requirements.

C. Submittal data required for applicable items listed below:

1. Fixtures
2. Cleanouts
3. Water heaters
4. Floor drains and roof drains
5. Valves and cocks
6. Thermometers and gauges
7. Aquastats
8. Pumps
9. Mixing valves
10. Insulation

15A.07 PRESSURE TESTS:

A. Plumbing and associated systems shall be subjected to constant inspection and final approval of the Architect/Engineer and code authorities having jurisdiction. Tests, in addition to those included in this section required to show compliance, shall be performed as directed.

B. Soil, waste and vent lines in the sanitary system shall be subject to a water pressure test of not less than 10' of waterhead pressure for a duration of not less than eight hours. During the pressure test, each joint shall be inspected for leaks. The lines shall be tested as an entire system, but all underground lines and concealed lines shall be given the above test and approved before the lines are covered.

C. The domestic water systems shall be subject to a water pressure test of not less than 150 psi for a duration of not less than two hours. The water piping shall be tested as an entire system, but all underground and concealed lines shall be given the above test before the lines are covered. Strike all joints during test.

D. The gas system from the meter connection and throughout the network shall be subject to an air pressure test of not less than 50 psi for a duration of not less than four hours. During this time of the test, each joint and connection shall be tested by applying soap suds to each joint. The gas piping shall be tested as an entire system, but all underground and concealed lines shall be tested and approved before being covered. Further, each exposed joint shall be tested with soap suds after gas has been admitted to the system. Oxygen shall not be used for test.

E. All work found to be defective or indicating leakage shall be removed and replaced with new materials. Tests shall be repeated until systems are proved tight. No test shall be conducted in freezing weather. Caulking or screwed joints will not be acceptable.

15A.08 CLEANING, PROTECTION AND ADJUSTING:

A. The Contractor shall remove from the job site all debris and leftover materials for which he is responsible, clean all fixtures and equipment and repair any blemishes in the finish. The Contractor shall be held responsible for replacing fixtures where damage results from failure to provide protection.

B. Flush Out Pipes: After the plumbing piping has been installed, inspected and approved, the piping system (water) shall be flushed to remove any foreign matter from the pipes. Where required by local codes, the piping system shall be sterilized with chlorine HTH solution to sanitize the new piping.

C. Adjusting: All fixtures shall be tested to insure proper operation of all working parts and adjusted to provide proper water flow.

15A.09 PAINTING:

A. All iron and steel hangers, angles, channels, clamps, etc. furnished and installed by the plumbing contractor shall be given at least two field coats of primer paint.

B. Equipment shall be touched up or repainted if required where original finish is scratched or damaged during shipping or installation.

15A.10 MAINTENANCE: All parts of the plumbing fixtures and associated equipment shall be maintained by the Contractor throughout the guarantee period. One month after final acceptance of the building by the Owner, the Contractor shall go over all fixtures and test all working parts and put everything in good working order. All fixtures, including

traps, shall be thoroughly cleaned and all parts put in good working order. This work is in addition to that involved under the paragraph "Guarantee". Two copies of a report of completion of this requirement shall be forwarded to the Architect.

15A.11 GUARANTEE:

A. All equipment and materials furnished and all work performed under this section shall be guaranteed to be free of defective materials and workmanship for a period of one year after final acceptance of the work by the Owner.

B. Upon notice from the Owner of failure of any part of the guaranteed equipment during the guarantee period, the affected part or parts shall be promptly replaced with new parts by the Contractor at no additional cost to the Owner. All labor required to perform guarantee shall be included as part of the complete guarantee warranty.

15A.12 EXCAVATION AND BACKFILL: The necessary excavation and backfill for the installation of the plumbing system shall be done in strict accordance with the requirements of these specifications. All junk metal shall be removed from the site before filling. The bottoms of all pipe trenches in rock or similar very hard strata shall be excavated a minimum of 6" below the pipe bottoms and refilled with 6" or more of sand and gravel, tamped in place. When ditches are excavated in cinders, organic soils or other injurous materials, these materials shall be excavated a minimum of 6" below the bottom of the pipe line and replaced with inorganic soil, sand or gravel, tamped in place. After pipe lines have been tested, inspected and approved, the trenches shall be backfilled with inorganic soil. The backfill shall be tamped in 4" layers along the sides of the pipe and for at least 1' above the pipe. The remainder shall be tamped in 6" layers except beneath walks and rods where 4" layers should be used.

15A.13 PIPING SYSTEM: Provide and install a complete piping system as shown on the drawings and as specified herein to supply water and gas at points of use and to remove storm water and waste products from the building and the site.

A. Piping:

1. Water Piping, Domestic Hot and Cold:

(a) Above Ground: hard drawn type 'L' copper tubing

(b) Below Ground: hard drawn type 'L' copper tubing, unless otherwise indicated

(c) Service Piping: Class 150 lb. cast iron with mechanical joints, except that piping 2-1/2" and smaller may be type 'K' copper tubing.

2. Gas Piping, Schedule 40 Black Steel:

   (a) 1" and smaller shall be screw type

   (b) 1-1/4" and larger and concealed piping shall be metallic arc welded

   (c) Buried pipe in contact with the earth shall be metallic arc welded and coated with high density "X-Tru-Coat" polyethylene with polyethylene tape coat joints.

3. Building Drain, Vent and Storm Drain Piping: Service weight cast iron soil pipe, caulk type hub and spigot pattern, tar coated.

4. Compressed Air Piping: Schedule 40 black steel above ground, Schedule 40 galvanized under ground.

B. Fittings:

1. Copper Piping: Sweat type, wrought copper. Provide reducing fittings to reduce pipe size. Bushings are not allowed.

2. Gas Piping:

   (a) Screwed: 150 lb. black threaded malleable iron banded screw fittings

   (b) Welded: Schedule 40, ASTM A-234, buttweld fittings

C. Joints and Unions:

1. Solder Joints in Copper Tubing: Wire solder in accordance with manufacturer's recommendations. Siflos solder shall be used on type 'K' tubing, 50/50 solder shall be used elsewhere and on copper waste piping.

2. Joints in Cast Iron Pipe: Caulked joints for cast iron hub and spigot pipe shall be firmly packed with white oakum and filled with molten lead not less than 1" deep and extending not more than 1/8" below rim of hub. No paint, varnish or other coating shall be permitted on the jointing material until after the joint has been tested and approved.

3. Threaded Pipe Joints: All burrs shall be removed; pipe ends shall be reamed or filed out to size of bore and all chips shall be removed. Pipe joint cement and paint shall be used on male threads.

4. Flared Joints: Flared joints for soft copper water tubing shall be made with fittings meeting approved standards. The tubing shall be expanded with a proper flaring tool.

5. Welded Steel Pipe: Metallic arc weld

D. Fixture Connections:

1. Water Closets: 4" cast iron stub with cast iron closet flange and preformed wax wetting ring.

2. Urinals: 2" brass pipe and brass fittings.

3. Showers: 3" cast iron P-trap and floor drain as indicated.

4. Lavatories and Drinking Fountain: 1-1/4" type 'M' copper arm with 1-1/4" C-MIP adapter at stack.

5. Service Sink: 3" galvanized wrought iron with galvanized cast iron drainage fittings.

6. Standard Counter Sinks: 1-1/2" type 'M' copper arm with 1-1/2" C-MIP adapter at stack.

7. Tubs: 2" CI 'P'-trap with 2 x 1-1/2" caulk adapter.

E. Identification of Piping: All hot water, hot water circulating, cold water, rainwater, sanitary, vent, drinking water and gas piping shall be labeled with pressure sensitive plastic tape pipe markers with 1" high letters and ASA color background. Labels shall be installed so as to be visible in boiler equipment, main shut-off valves and zone valves and in concealed spaces at valves. Install arrow marker at each label to indicate direction of flow.

F. Grades:

1. Interior horizontal drainage piping of 3" diameter and less shall be installed with fall of not less than 1/4" per foot. Drainage piping larger than 3" diameter shall be installed with fall of not less than 1/8" per foot, unless otherwise shown.

2. Exterior horizontal drainage piping shall be installed when minimum fall as described in foregoing paragraph, unless otherwise noted. Batter boards and grade stakes shall be set up over pipe ditch when laying pipe to insure uniform slope and straightness.

3. Water piping shall be graded for drainage with valves at low point.

15A.14 VALVES, COCKS AND SPECIALTY ITEMS: Provide and install as shown on the plans and as specified as follows:

		2" & Smaller		2-1/2" & Larger
A.	Gate Valves: 200 psi WOG; non-rising stem, solid wedge; solder ends and screw-in bonnet on sizes 2" and smaller; flanged ends and bolted bonnet on sizes 2-1/2" and larger.	N.S.	S-123	F-619
		H.	IB-647	IR-820F
		M.	1145	2882
		C.	1324	461
		P.	1822	1787
B.	Globe Valves: 200 psi WOG; 2" and smaller, screw-in bonnet, integral seal, renewable discs, solder ends. 2-1/2" and larger; bolted bonnet renewable seat and discs, flanged ends.	N.S.	S-211-W	F-718-W
		H.	IB-424	IR-860F
		M.	520	241
		C.	1310	351
		P.	1823	241
C.	Check Valves: 200 psi WOG; Horizontal swing; 2" and smaller; regrinding type, renewable discs, Y-Pattern, solder ends. 2-1/2" and larger; bolted bonnet, renewable seat and discs, flanged ends.	N.S.	S-413-W	F-918-W
		H.	IB-945	IR-880-F
		M.	1513	2974
		C.		373
		P.		559
D.	Ball Valves: (Balanced Cocks); 400 psi WOG full port, 3-pc. construction, blow-out proof stem solder ends.	N.S.	S-595-Y	
		H.	BV-812	
		M.		
		C.	2330-T	
		P.	4201-T	
		R.	302	
E.	Gas Cocks: Lubricated plug valve, bolted gland, 175 lb. WOG; threaded ends for valves 2" and smaller; flanged ends, valves 2-1/2" and larger.	A.C.F.	1430	1431
		R.	142	143
		W.	1796	1796F
		N.	142	143
		P.	2200	2201
F.	Sillcocks: Provide WATTS 8A or NIDEL 34HD vacuum breaker.	N.S.	763	
		H.	1034	
		C.F.	293	
G.	Hose Bibbs: Chrome plated. Provide WATTS 8A or NIDEL 34H vacuum breaker.	C.F.	13	
		KOHLER	K-7873	
		AMER. STD.	4230.074	
H.	Wall Hydrants: Freezeless, with NIDEL 34HD vacuum breaker.	WOODFORD	95	

I. Thermometers: 7" scale, separable socket, adjustable angle, 3-1/2" stem with a scale from 30°F in 2°F divisions; DURO 7" EZ, WEKSLER No. AA5a, WEISS 7VS 3-1/2.

J. Pressure Gauges: 3-1/2" dual, phenol case with range of 0-160 psi: WEKSLER No. 900, DURO 105, WEISS 4PG-E.

K. Aquastats: Direct immersion type, mounted in 1-1/4" tee: WHITE & ROGERS, BARBER-COLEMAN, MINNEAPOLIS-HONEYWELL.

L. Dielectric Unions: Install where ferrous and non-ferrous metals join.

M. Air Chambers: Provide at all fixtures on hot and cold water lines, 18" long by one pipe size larger than branch line, 3/4" minimum.

N. Notes: Valve manufacturer abbreviations are as follows: C-Crane, CF-Chicago Faucet; H-Hammond, M-Milwaukee; N-Nordstrom; NS-Nibco Scott; P-Powell; R-Rockwell; W-Walworth.

15A.15 HANGERS, SUPPORTS, SLEEVES AND ESCUTCHEON PLATES:

A. All piping shall be supported as specified herein and within 3' of all changes in direction.

1. Upper Attachment:

(a) Welded Beam Attachment:

F&M Fig. 255
Elcen Fig. 67
F&S Fig. 966A

(b) "C" Clamp:

F&M Fig. 255
Elcen Fig. 29
F&S Fig. 57

(c) "C" Clamp with Locknut:

F&M Fig. 255L
Elcen Fig. 29A
Grinnell Fig. 86
F&S Fig. 57L

(d) Channel Iron: When piping runs parallel to bar joists and cannot be hung directly from joists, provide angle iron to span two bar joists and use angle iron as upper attachment.

Size as follows:

For Piping up to 1-1/4": 2" x 2" x 1/4"

For Piping 1-1/2" and Larger and for Multiple Runs of Smaller Piping: 3" x 3" x 1/4"

2. Pipe Attachments:

(a) Cast Iron Pipe Hangers:

F&M Fig. 239
Elcen Fig. 12
Grinnell Fig. 260

(b) Copper Tubing Hangers:

F&M Fig. 365
Elcen Fig. 394
Grinnell Fig. 97

(c) Wrought Iron and Steel Pipe Hangers:

F&M Fig. 239
Elcen Fig. 12
Grinnell Fig. 260

(d) Trapeze Hangers: Angle Iron with V-Bolts; Use same sizing criteria as for upper attachments.

3. Hanger Rods:

Piping: 1/2" to 2": 3/8" rod
2-1/2" to 3": 1/2" rod
4" to 5": 5/8" rod
6": 3/4" rod
8" to 12": 7/8: rod

4. Vertical Supports:

(a) Offset Pipe Clamp:

F&M Fig. 366
Elcen Fig. 44

(b) Riser Clamp:

F&M Figs. 241, 368
Elcen Fig. 39
Grinnell Fig. 261

5. Horizontal Spacing:

(a) Cast Iron Piping: 5' lengths: 5'
10' lengths: 10'

(Locate supports as near as possible to hubs.)

(b) Copper Tubing: 1-1/2" and Smaller: 6'
2" and Larger: 10'

(c) Threaded Piping: 12'

(d) Plastic Piping: 4'

6. Vertical Spacing:

(a) Cast Iron Piping: At base and a minimum of one more support for each story level. Maximum spacing of 15'.

(b) Threaded Piping: At base and at not less than every other story at intervals not exceeding 30'.

(c) Copper:

1-1/2" and Smaller: 4'
2" and Larger: Minimum of one support for each floor

B. Provide sleeves for all piping through building construction as follows:

1. Above Grade, Interior: Schedule 40 galvanized steel pipe sections of sufficient size to accomodate piping and insulation with maximum gap of 1/4" around insulation.

2. Exterior Walls: Cast iron pipe sections

3. Floor Slab: Sleeves shall not be required on cast iron waste piping passing through the floor slab.

4. Sleeves shall be reamed after cutting and shall be of length equal to the width of the wall such that both ends of the sleeve are flush with the wall surface; sleeves through the floor shall extend not less than 1" above floor slabs.

5. Annular spaces between sleeves and piping shall be filled and caulked with Dow-Corning 780 or Thiokol Caulking.

C. Exposed insulated and uninsulated pipes through floors, walls and ceiling shall be fitted with chrome plated escutcheon plates. Each plate shall be large enough to completely hide the hole around the pipe. Plates for exposed insulated pipes shall be sized for the outside diameter of the insulation. Plates shall be securely fastened in place.

15A.16 INSULATION: Provide and install insulation for piping as specified herein:

A. Hot water, cold water, hot water recirculating and building storm drain piping concealed in walls, chases and above ceilings shall be insulated with 1/2" thick, not less than 3PCF density, fiberglas pipe covering with factory applied fire retardant vapor barrier jacket held in place with aluminum bands, 18" O.C. with bands at each fitting, outlet or bend. Bands to be 3/4" wide x .007" thick. Joints in cold water and storm drain pipe covering shall be sealed with vapor barrier adhesive and joint sealer strip. Fittings shall be insulated with pipe covering mitered to fit and finished with Weber's Quick-Set hydraulic

setting mineral wood of the same thickness as the pipe covering and finished with 1/16" thick Nokorode "Seal-Kote" mineral stabilized asphalt waterproofing compound.

B. Hot water, cold water, hot water recirculating and building storm drain piping exposed to view shall be insulated with 1" thick not less than 3PCF density fiberglas, pipe insulation with 8 oz. canvas jacket. Pipe covering jacket shall be secured with Arabol lagging adhesive. All surfaces of the canvas jacketing after securing coat has dried shall be given a final coat of undiluted Arabol or Insul-Coustics 130.

C. Drains from drinking fountains shall be spirally wrapped with No-Drip insulating tape with each layer overlapping not less than 1/2". Drains shall be insulated from fountain to point where branch waste connects to main.

D. Exposed fixture connections shall not be covered.

E. Staples are prohibited on insulation.

F. Insulation shall be as manufactured by Owens-Corning, Gustin-Bacon, Armstrong or Johns-Manville.

15A.17 ROOF FLASHINGS:

A. Provide and install waterproof flashing at all roof penetrations.

B. The flashing roof connection shall meet the approval of the roofing material manufacturer and shall meet roof bond requirements.

C. Vent pipes passing through roof shall be flashed with 4 lb. sheet lead. Flashing shall be barrel type, extended up sides of vent pipe and turned down inside of vent pipe. See drawings for VTR detail.

D. Roof drains shall be flashed with 4 lb. sheet lead. Flashing shall extend a minimum of 12" out from drain dome and shall be caulked to drain body. Flashing collar shall then be secured in place to provide a waterproof installation. See drawings for roof drain detail.

15A.18 CLEANOUTS:

A. Provide cleanouts where shown on the drawings and as follows:

1. At a maximum spacing of 50' on 4" and smaller lines; At a maximum spacing of 100' on larger lines.

2. At all changes in building drain directions greater than 45^{o}.

3. At or near the foot of each vertical waste or soil stack.

B. All cleanouts shall be accessible and shall be installed allowing a clearance of not less than 18" for the purpose of rodding.

C. Schedule:

Location	Finish	Josam	Smith	Wade	Zurn
Finished Floor	Nickel Bronze (1)	58000	4025	8010	ZN-1405-2
Wall	Stainless Steel	58790	4530	8460-R	ZN-1445-1
Outside	Cast Iron	58470	4285	8540-S	Z-1450-8

D. Notes:

1. Provide carpet markers for cleanouts in carpeted floors.
2. Provide wrench with each type cleanout.
3. After installation of cleanouts, remove plug, grease threads and replace.
4. Cleanouts shall be of the same nominal size as the pipe to which they are joined except that no clean-out shall be smaller than 3".
5. See drawings for installation details.

15A.19 FLOOR DRAINS AND ROOF DRAINS:

A. Provide and install floor drains as shown on the drawings and as specified herein. Drains shall have coated cast iron bodies with double drainage flanges and bottom outlet, inside caulk connections, with strainers and special items as indicated in Schedule.

B. Provide and install roof drains as shown on the drawings and as specified herein. Drains shall be coated cast iron with aluminum domes and no-hub outlets.

C. Schedule:

Type	Strainer Dome	Special	Josam	Smith	Wade	Zurn
FDA	5" N.B.		30000-A	2010-A	W-1100-A	ZN-415-B
FDB	7" Lacquer	Sediment Bucket	32020	2109-B		Z-507-5
FDC	5" N.B.	Back-Water Valve	30000-AJ	2010-A-V	W-1100-BV	Z-415-V
RD	16" aluminum	No-Hub Outlet	21500-D	1010-C	W-3500	Z-103-RC

15A.20 FIXTURE SCHEDULE:

A. Furnish and install all plumbing fixtures complete with all equipment, fittings, trim, carriers, supports and accessories as required for a complete installation.

B. All fixtures shall be Grade A. The name and trademark of the manufacturer shall be printed or pressed on all closets and lavatories. All fixtures shall be thoroughly cleaned after installation.

C. Fixture Schedule:

Fxtr. No.	Item	Special	Kohler	Amer. Std.	Just
P-1	Water Closet	15"	K-4282-ET	2222.016	3-297
	Seat	See Note #3.			
	Flush Valve	See Note #1.			
P-2	Water Closet	18"	K-4268-ET	9468.018	3H-701
	Flush Valve	See Note #1.			
	Seat	See Note #3.			
P-3	Urinal		K-5014-T	6540.017	7-105
	Flush Valve	See Note #2.			
	Carrier	See Note #4.			
P-4	Lavatory	20" x 18" wall hung	K-2022	0361.055	1-195-V
	Supply & Drain		K-7401-T	2103.703	8-2045A
	Supplies	3/8"	K-7606	2303.154	8-5002
	Trap	1-1/4" Adj.	K-90000	4418.026	8-5160
P-5	Lavatory, Wheel Chair, 20" x 27"		K-12634	9140.013	1H360
	Supply Fitting		K-13344	2238.129	8H2055A
	Drain		K-13885	7723.018	
	Supplies		K-13711	7536.014	8H5029
	Tailpiece		K-7620	2340.016	
	Trap		K-9000	4401.063	8-5260
	Carrier	See Note #5.			
P-6	Service Sink,	22" x 18"	K-6716	7692.049	7-564
	Supply Fitting		K-8906	8341.075	8-3756
	Trap		K-6673	7798.176	7-620
	Rim Guard		K-8936	8379.018	8-7501
P-7	Sink, Sing. Comp. 12" deep, 22" x 25"		JUST SLXD-2225-A-GR w/JV35 Strainer		
	Faucets	w/4" wrist handle	K-13341	2238.205	
	Supplies		K-7606	2303.154	
	Trap	1-1/2" Adj.	K-9000	4419.040	
	Faucets		K-6894	4200.010	
	Strainer		K-8801	4331.013	
	Supplies	3/8"	K-7606	2303.154	
	Trap	1-1/2" Adj.	K-9000	4419.040	
P-8	Electric Water Cooler (Wheel Chair)		HALSEY TAYLOR	WC7A	
			OASIS	ODP7WM	
			SUNROC	SWC8	
			WESTINGHOUSE	WWC07T	
	Trap	1-1/4" Adj.'P'	K-9000	4401.014	8-5160
	Supplies		K-7606	2303.154	8-5002

P-9	Wash. Machine Box	GUY GRAY B-200
P-10	Shower Head	K-7370 1422.016
	Control Faucets	K-7227-T 1303.536
	Arm	K-7397 1444.017

P-11 Kitchen Sink - Furnished under Architectural. Make connections and provide grease trap in floor under sink.

D. Notes:

1. Water Closet Flush Valves: SLOAN Royal 110 Series
   DELANEY Flushboy 402 Series
   WATROUS Polaris W-130 Series

2. Urinal Flush Valves: SLOAN Royal 180 Series
   DELANEY Flushboy 452 Series
   WATROUS Polaris W-100 Series

3. Water Closet Seats: CHURCH 9900
   OLSONITE 1050
   BENEKE 525CH

   (All seats shall be white.)

4. Urinal Carriers: JOSAM 17810
   WADE W-452
   ZURN Z-1222

5. Lavatory Carriers: JOSAM 17100
   WADE W-521-1
   ZURN Z-1231

15A.21 WATER HEATING SYSTEM:

A. Water Heaters: Furnish and install water heaters as shown on the plans and as specified herein.

1. Water Heater 1 shall be gas fired and shall have a storage capacity of 100 gal., a minimum natural gas input of 197,000 BTU/H and a recovery rate of 166 GPH at 100° temperature rise. Water heater 2 shall be gas fired and shall have a storage capacity of 75 gal., an input of 140,000 BTU/H and a recovery rate of 117 GPH at 100° temperature rise. Heaters shall be AGA certified with a tank test pressure of 300 psi and a working pressure of 150 psi. Controls will consist of an electric gas valve, aquastat and high limit control activated by self-generating current supplied from the thermo-couple. Safety pilot 100% safe shut down type. Furnish and install an approved type relief valve. Heaters shall have a full 2" insulation blanket, large burner access door and a hand-hole cleanout. Water heater shall be covered by a 3-year commercial warranty. Water heaters shall be LOCHINVAR, A.O. SMITH or STATE.

2. Water Heater 3 shall be electric with a storage capacity of 50 gal. and an input of 4500 watts, 208V, single-phase. Maximum height shall be 33".

B. Recirculating Pump Assembly:

1. Pump shall be all bronze, centrifugal, in line, oil lubricated, specifically designed for quiet operation and suitable for 125 psi working pressure.

2. Motor shall be of the open, drip proof, sleeve bearing, quiet operating, rubber mounted construction with built-in automatic reset, thermal overload protectors for operation on 120 volts, single phase, 60 hertz.

3. Pump assembly shall be sized as shown on drawings and shall be as manufactured by BELL & GOSSETT '75' or equal by TACO or THRUSH.

C. Mixing Valve: RADA 566 or equal by LAWLER.

D. Specialty Items: Provide and install thermometers, gate valves, check valves, aquastats and piping as shown on riser diagrams. See other paragraphs of these specifications for these items.

E. Concrete Pad: Provide concrete pads for water Heaters 1 and 2. Pads shall be 4" deep with No. 3 rebars, 12" on center both ways and with chamfer edges.

15A.22 PRESSURE REDUCING SYSTEM:

A. General: Provide and install pressure reducing system in water main at building service entrance. System shall have capacity of supplying 100 GPM of water with not over a 10 psi pressure change from a no-demand condition to a maximum-demand condition.

B. Equipment shall include pressure reducing valve with integral, by-pass check valve, strainer, pressure gauges and all valves and unions required. See drawings for piping detail.

Reducing Valve:	WATTS 223
Strainer:	WATTS 27
Pressure Gauge:	See special items
Shut-Off Valve:	See gate valves and globe valves

C. Install in Mechanical Room with adequate access to all components. Provide for drainage.

D. Shop drawings shall include list of all components to be used, piping schematic and layout diagram with dimensions.

15A.23 COMPRESSED AIR SYSTEM:

A. General: Provide and install air compressor/distribution piping system as shown on drawings and as specified herein. System shall be installed complete and shall be left in first class operating condition.

B. Air Compressor: Three horsepower, two-stage tank-mounted unit type air compressor with capacity of not less than 10 CFM at 175 psi. Vertical tank shall have minimum capacity of 60 gal. Standard features shall include but not be limited to: Positive dispacement rotary oil pump; automatic starting unloading; automatic low oil level/low oil pressure unloading; start-stop controls; deep-finned intercooler; separate, detachable deep-finned cylinders; rifle drilled crankshaft; matched and balanced pistons; receiver pressure gauge; receiver safety valve; receiver shut-off valve; intercooler safety valve; totally enclosed crankcase; separately removable valve housings; precision finished disc type valves; counterbalanced crankshaft; tapered roller main bearings; insert type connecting rod bearings; full floating wrist pins; receiver drain valve, silencer type intake filter.

C. Air Dryer: Provide refrigerated air dryer with valved by-pass and pressure relief valve set at 200 psi. Piping shall be as shown on plans with all shut-off valves, drain valves, filters, regulators, lubricators and outlets as detailed. Provide and install quick-connect couplers compatible with shop equipment not furnished under this section. Compressor shall be LINCOLN 9243-26 or SAYLOR-BEALL VT-720.

D. Motor Starter: Provide motor starter to be installed by electrical Contractor.

15A.24 GREASE TRAP:

A. General: Provide and install grease trap as shown on drawings and as specified herein.

B. Grease trap for kitchen shall have a minimum flow rate of 20 GPM and a grease storage capacity of 40 lbs. Unit shall have non-skid cast iron cover and shall be installed flush with the floor. Unit body shall be cast iron painted inside and outside. Manufacturer shall be JOSAM, SMITH, WADE OR ZURN.

SECTION 15B

HEATING, VENTILATING & AIR CONDITIONING

15B.01 GENERAL: Applicable provisions of the General Conditions of the contract and special requirements govern work under this section.

15B.02 CODES, PERMITS AND ORDINANCES: Where requirements of these specifications exceed specified codes and ordinances, conform to these specifications. Materials and equipment included in Underwriters Label Service shall bear that label. Electrical equipment shall be UL approved as installed. The installation shall conform to the regulations of the Board of Fire Underwriters. Obtain all permits necessary, paying all fees in connection therewith.

15B.03 SHOP DRAWINGS:

A. General: Contractor shall check data carefully to insure compliance with specifications prior to submitting. Submittal shall be assembled in complete sets, by trade, and bound with an index sheet and tabs. Submittal data shall be submitted at one time unless unavailable drawings would delay job progress. Data shall include complete installation instructions, dimensional data and electrical data, including BHP and motor HP.

B. Submittal data (six sets required) shall include the following:

1. Furnaces
2. Condensing units and cooling units
3. Unit heaters
4. Electric duct heater
5. Grilles, registers, diffusers
6. Ductwork accessories
7. Insulation and duct liner
8. Fans
9. Electric cabinet heaters
10. Room air conditioning unit
11. Starters and contactors
12. Controls and control diagrams. Interlock wiring with refrigeration and heating equipment approved by equipment manufacturers.
13. Operating instructions
14. Power wiring requirements of all equipment tabulated on separate sheet
15. Letter from Contractor stating that submittals have been checked and comply with specifications.

15B.04 SUBSTITUTIONS: All costs incurred by acceptance of substitutions shall be borne by the Contractor. Refer to General Conditions.

15B.05 GUARANTEE:

A. The Contractor shall guarantee all systems installed under this section as to equipment performance and workmanship for a period of one year from date of acceptance by the Owner. Refer to other paragraphs of this section for additional equipment warranties.

B. Instructions: Instruct operating personnel designated by the Owner in operation of system. Provide signed statement certifying instructions have been received. Frame sequence of operation under glass and mount on wall as directed.

C. Warranties: Provide manufacturer's warranties prior to final inspection.

D. Noise and Vibration: When in operation, all systems shall be free from objectionable or abnormal noise and vibration.

15B.06 MANUFACTURER'S RECOMMENDATIONS: The assembly, erection, testing or adjusting of equipment shall be in accordance with the manufacturer's published instructions shipped with the equipment.

15B.07 SPACE CONDITIONS: All apparatus shall fit into the available spaces in the building and must be introduced into the building at such time and in such a manner as not to cause damage to the structure.

15B.08 DRAWINGS: Plans are diagrammatic and show generally the location of the equipment, ducts and pipes, but are not to be scaled. Prefabrication of work from drawings shall be at Contractor's risk.

15B.09 CUTTING AND PATCHING: Cutting and patching in connection with the installation shall be done by the trade whose work is to be cut. Contractor shall lay out and install his work ahead of the work of other trades wherever possible.

15B.10 COMPLETION OF WORK: At the completion, an inspection shall be made and the entire system shall be shown to be in specified working condition. The following shall be available during the inspection:

A. Contractor representative
B. Mechanic with hand tools
C. Specified test data
D. Certificates
E. Complete specifications and drawings with all addenda and revisions.

15B.11 OPERATING AND MAINTENANCE INSTRUCTIONS:

A. Three bound and indexed Operating and Maintenance Manuals shall be prepared by the Contractor and submitted for approval prior to delivery to operating personnel.

B. Each Manual shall contain the following information, data and drawings:

1. List of contents. Insert under front cover.

2. Copy of approved submittals, equipment and materials.

3. Installation, operating and maintenance instruction for each item of equipment.

4. Manufacturer's list of renewal parts for each item of equipment with recommended stock items and quantities indicated.

5. Control diagrams, electrical interlock diagrams.

6. Copy of shop drawings showing layouts and construction details.

7. Copy of Test and Balance Reports, including list of instruments and description of methods employed.

15B.12 PROTECTION OF MATERIALS AND EQUIPMENT:

A. Maintenance of Filters: The Contractor shall be responsible for maintaining all air filters until final certificate is issued. No air system shall be operated at any time without air filters and filters not be allowed to become overloaded with dust and dirt. For throwaway filters, new clean filters shall be installed at final inspection; washable filters shall be cleaned.

B. During Construction: Pipe openings shall be closed with caps or plugs. All equipment shall be tightly covered and protected against water, dirt and chemical or mechanical injury. All equipment and material shall be stored in accordance with manufacturer's recommendations.

C. Prior to Final Inspection: All materials and equipment shall be cleaned. Chipped or scraped paint shall be retouched to match. All dents and sags in ductwork and equipment casings shall be straightened.

D. Equipment Painting: Equipment which has been damaged beyond the point of retouching or has been retouched not to match shall be completely painted in accordance with Painting Section.

15B.13 AIR DISTRIBUTION SYSTEM:

A. General: Include supply, return, outdoor air, relief and exhaust ductwork; acoustical liner and accessories as shown, to make a complete air distribution system. Place numbers referred to are SMACCNA Low Velocity Duct Construction Standards, Fourth Edition.

B. Duct Fittings and Accessories:

1. Duct Hangers: Plates nos. 16, 17, 18, 19 and 20. Ducts shall not be supported from the roof deck.

2. Flexible Connections: Install where shown and at all locations where ductwork connects to mechanical equipment of fireproof material composed of watertight, impregnated 30 oz. glass fabric. Plate 46.

3. Branch from Trunk Duct and Tap-In Connections: Plates 25 and 26.

4. Angle Frames: 24 ga. galvanized with mitered corners. Provide where exposed ducts penetrate walls, such as in the Mechanical Rooms.

5. Access Panels and Doors: Ventlok insulated access doors; Plate 31. Fig. B, insulated where duct is insulated or lined. Inside dimensions shall be sized to provide access to damper, 12" minimum except one dimension shall be 2" smaller than duct for ducts under 14". Provide at all volume dampers, fire dampers and electric duct heater. Seal door duct joints air-tight for low pressure duct pressures in accordance with manu-facturer's recommendations shipped with door.

6. Turning Vanes: Plate 22, Fig. A for 18" width and less; Fig. C over 18" width or height. Provide at all square elbows in the supply ductwork and where noted.

7. Easements: Plate 24.

8. Manual Volume Dampers: Plate 28, Figs. A and C with brass pivots and Plate 29, Fig. A, unless noted otherwise. Dampers shall be provided with heavy duty locking quadrants outside insulation. Seal all duct openings airtight.

9. Splitter Dampers: Length of damper shall be minimum of 1-1/2 times width of smaller split dimension with 12" minimum length. Provide locking type push rods or locking quadrants outside insulation if push rods cannot be used. Seal all duct openings airtight.

10. Traverse all low pressure supply duct joints and return duct joints. Tape with flame resistance polyethylene impregnated and coated 9 mil thick duct tape, 50 oz. per sq. in. minimum adhesion. Taped joint shall be 3" total width minimum.

11. Patch Plates: Patch plates shall be one gauge heavier than duct. Secure with sheet metal screws 6" maximum O.C., minimum two per side with airtight gasket.

C. Low Pressure Ductwork: Best bloom galvanized steel of gauges and construction shown in the following table. Metal stamp shall be visible after installation.

TABLE OF LOW PRESSURE DUCT CONSTRUCTION

Dimensions in Inches	Gauge	Joints		Angle Reinforcing Between Joints
		Longer Sides	Shorter Sides	
Thru 12	26	Hemmed 'S' Slip	Drive Slip	-----
13 - 18	24	D.O.	Drive Slip	-----
19 - 30	24	1" Bar Slip	Reinforced Drive Slip	1 x 1 x 1/8 @ 5' O.C.
31 - 42	22	D.O.	1" Bar Slip	D.O.
43 - 54	22	1-1/2" Bar Slip	Same as Longer Side	1-1/2 x 1-1/2 x 1/8 @ 5' O.C.
55 - 60	20	D.O.	D.O.	D.O.
61 - 84	20	1-1/2" Reinforced Bar Slip 1/3/8 x 1/8 Bar	D.O.	1-1/2 x 1-1/2 x 1/8 @ 30" O.C.
85 - 96	18	1-1/2" Angle Reinforced Pocket Lock	D.O.	1-1/2 x 1-1/2 x 3/16 @ 30" O.C.
Over 96	18	2" Angle Reinforced Pocket Lock	D.O.	1-1/2 x 1-1/2 x 3/16 @ 30" O.C.
Thru 8Ø	24	Lock type seal - Crimped and beaded girth		
9 - 22	22	D.O.	D.O.	
23 - 36	20	D.O.	D.O.	

1. Gauge is determined by dimension of longest side of duct.
2. Reinforcing at joints is same size as reinforcing between joints.
3. Fasteners for angle reinforcing shall be 6" O.C.
4. Fasten round ducts 6" O.C. maximum at girth joints.
5. Drive slips shall be used on short sides 18" or less and reinforcing drive slip shall be used on short sides 19 to 30" except when pocket lock is called for on long sides, use on all four sides.

D. At the Contractor's option, the supply and return air ductwork may be fabricated from 1-1/2" thick fiberglas ductboard similar to Johns-Manville "Micro-Aire" type 'RDS'. Ducts and fittings shall be fabricated and installed with all longitudinal and circumferential joints secured with type 'FA' tape, heat sealed and bonded in accordance with the manufacturer's recommendations.

The entire installation shall meet the requirements of UL Standard 181 for Class 1 air ducts and shall be fabricated and installed in strict accordance with the manufacturer's recommendations. Operating limitations for the fiberglas ductwork system shall be maximum 2000 fpm velocity and maximum 2" water gauge static pressure. Hanger construction and spacing shall be in accordance with the latest edition of the SMACCNA manual for Fibrous Glass Ducts. In the event the Contractor chooses to fabricate the supply and return air ductwork from fiberglas ductboard, he shall still fabricate the exhaust, relief air and outdoor air ducts and all plenums from sheet metal as outlined in sub-paragraph (c) above.

E. Kitchen Range Exhaust Ductwork:

1. Fabricated from 16 ga. black steel with welded joints and seams. The ducts shall be free from interior obstructions and shall run straight up from exhaust connection of hood to the roof exhaust fan where possible. Where elbows or offsets cannot be avoided, they shall be radius type with centerline diameter minimum 1-1/2 duct widths. Finish ducts with hammer-tone gray paint.

2. Exhaust duct shall extend 40" above finished roof.

F. Flues from Furnaces, Unit Heaters and Domestic Hot Water Heaters: Type 'B' double wall flue piping from equipment connections to cap on roof as indicated on the drawings.

G. Flue Caps: Galvanized steel, non-back draft design. Minimum gauges: Up thru 12" neck diameter, 24; 14" and 18", 22; 20" and 24", 20; 20" - 18", 18. Acme MVR; Breidert type 'L'; Louvers & Dampers SV; Penn Omega; Triangle AFL. Refer to the detail on the drawings.

H. Louvers: 4" deep galvanized, 16 ga. minimum stormproof blades and frame, prime coated, with back mounted 1/2" mesh screen, de-mountable frame. Maximum pressure drop 0.20" w.g. at 400 FPM face velocity. American Warming and Ventilating LW-P-130, Carnes L-41F, Louvers & Dampers EL-100 Series, Ruskin L5.

I. Ductwork Acoustical Liner: Plate 48, Fig. B glass fiber duct liner, 1-1/2 lb. density, with mat faced, coated finish. Liner shall be securely glued to inside of ductwork during fabrication with fire retardant adhesive and further anchored with Graham Insul-Pins and Insul-Clips. Adhesive shall be Benjamin Foster 81-60, Insul-Coustic 225 or Certite. Liner and adhesive shall have flame spread classification of not more than 25 and a smoke developed rating of not more than 50. Line supply and exhaust ducts where noted and line all outside air relief and return ducts. Provide 26 ga. shield on leading edge at fan discharge and at dampers. Longitudinal and traverse joints on supply ducts shall be coated with adhesive and shall be under compression when installed to prevent air leaks and duct condensation. Liner thickness shall be 1/2" thick. Duct sizes indicated on the drawings are clear inside dimensions. Where duct liner occurs, increase the sheet metal duct sizes as required to accomodate liner, except at connections to equipment, which shall be equipment correct size.

J. Access Doors in Walls or Ceilings: Access doors to hidden mechanical equipment and accessories, dampers, controls, valves and air vents shall be provided in walls and ceilings where accessories are not otherwise accessible, i.e., lift-out ceilings. Access doors shall be Milcor style A, B, K, L or H, to suit construction as manufactured by Inland Steel Products Company. Door minimum size shall be 12" x 12" in walls and 24" x 24" in ceilings. Provide doors not provided under Miscellaneous Metals. Doors by Titus style 1, 2, 3 or 4; Krueger style A, B, C, D E are acceptable.

K. Moisture Integrity:

1. Roof: All roof curbs and roof penetrations shall be watertight.
2. Walls: All wall fans, louvers and wall penetrations shall be watertight.

15B.14 GRILLES, REGISTERS AND DIFFUSERS:

A. Provide all supply, return and exhaust grilles, registers and diffusers indicated in the drawings with deflectrols behind each supply diffuser. Ceiling supply diffusers shall be complete with air pattern control devices. Provide steel dampers of the opposed blade design in all supply registers and diffusers and on return and exhaust registers where noted on the drawings. Finishes shall be as indicated and the interiors of all ceiling mounted registers and diffusers shall be factory painted flat black.

B. Diffusers shall be Carnes model numbers indicated or approved equal by Barber-Coleman or Kreuger.

15B.15 GAS FIRED FURNACES:

A. Furnaces shall be complete with heavy gauge steel cabinets with baked on enamel finish, ceramic coated steel or stainless steel heat exchangers, upshot gas burner, burner controls with 100% safety shut-off, quiet operating centrifugal fans designed for air conditioning air quantities, adjustable pitch V-belt fan drive, fan motor and additional accessories indicated on the drawings. The furnaces shall be designed to operate with multiple units attached to one cooling coil. The furnaces shall be covered by a ten-year non-prorated warranty.

B. The units shall be size, capacities and arrangement indicated on the drawings and shall be Carrier models or approved equal by Lennox, Carrier or York.

15B.16 COOLING COILS: Cooling coils shall be constructed of non-ferrous tubes and fins and shall be enclosed in baked-on enamel finished steel cabinets. The coils shall be designed to fit the furnace units and shall be of capacities indicated. The coils shall be provided with refrigerant distributors and thermal expansion valves of proper capacities to match the coil load. The coils shall be manufactured by air conditioning equipment manufacturer.

15B.17 AIR COOLED CONDENSING UNIT:

A. The air cooled condensing units shall be of proper design to match the cooling coils and shall be of adequate size to produce the desired capacity with 95°F ambient air. Condensing units shall be complete with heavy gauge steel, water-proofed cabinet with baked enamel finish; spring mounted hermetic or semi-hermetic compressor(s), condensor fan(s), fan motor(s), condenser coil; compressor contactors; fan contactors; controls and all items required. Compressor(s) shall be complete with manual reset high pressure cut-out, low pressure cut-out, compressor motor overload protection, time guard and anti-recycling control, crankcase heaters and additional controls as standard with the manufacturer. All electrical components shall be factory prewired to terminal blocks ready to receive power supply and control wiring from remotely located control devices. The units shall be factory tested, dehydrated, charged with holding charge of refrigerant and sealed before shipment. The condensing units shall be covered by a five year warranty to cover the compressor(s) and refrigeration circuit.

B. Units shall be Carrier model numbers indicated or approved equal by Lennox, Trane or York.

15B.18 ROOM AIR CONDITIONING UNIT:

A. Unit shall be thru-the-wall type complete with direct expansion cooling section, electric heat section, fans, compressor and accessories all mounted on a chassis designed to slide in the wall sleeve. Overall dimensions of the wall sleeve shall be sized to match brick-block coursing.

B. The front panel shall be finished in baked enamel with top air discharge. The thermostat shall be unit-mounted with standard operating controls.

C. The unit shall comply with the requirements of ARI 210 and shall be tested, rated, labeled and listed accordingly. In addition, each unit shall be labeled in accordance with UL Standard 484.

D. Manufacturer: G.E. model number or equal and approved by Nesbitt or Singer.

15B.19 ELECTRIC CABINET HEATERS:

A. General: Electric wall cabinet heaters shall be complete with fan, fan motor, spiral-wound heating elements, discharge louvers, concealed return air openings, disconnect switch and integral, tamper-proof thermostat. Each unit shall be housed in a heavy duty steel cabinet, surface or recessed as indicated, with baked-on enamel finish with styled front panel.

B. Unit capacities and model numbers shall be as indicated on the drawings or equal and approved.

15B.20 ELECTRIC DUCT HEATER:

A. Provide and install where indicated on the drawings, electric duct heater, as manufactured by Chromalox type DHOC or equal and approved products by Indeeco, Raywall or Valley.

B. Heating coils shall be constructed of high quality 80% nickel, 20% chromium coiled resistance wire, supported with reinforcing brackets. Bracket bushings and terminal insulators shall be securely positioned and made of high grade ceramic. All frame members, control box and associated sheet metal parts shall be constructed of heavy gauge aluminized steel. The terminal box shall be provided with a totally enclosed cover with hinged front.

C. The heater shall be flanged type for duct mounting, shall be UL listed for zero clearance to combustible surfaces and shall meet the requirements of the 1978 National Electric Code.

D. All factory wiring in the power circuit shall be insulated copper conductors, brought to clearly marked terminals. The heater shall be equipped with automatic reset and manual reset disc type thermal cut-outs. An insulation barrier shall be provided between the terminal box and the duct.

15B.21 GAS FIRED UNIT HEATERS:

A. General: Propeller type unit heaters for use with natural gas complete with all appurtenances including all welded aluminized steel heat exchanger; burners; draft diverter; quiet operating totally enclosed sleeve bearing motor with built-in thermal overload protection and double deflection louver diffuser. Heaters shall be AGA approved for installation shown and shall be equipped with integral junction boxes for power and control connections, automatic gas valve, electric pilot ignition, pressure regulator with leak limiting device, manual main and pilot valves and high limit switch.

B. Manufacturers: Trane or equal by Carrier, Lennox, Modine or Reznor.

15B.22 REFRIGERATION PIPING AND ACCESSORIES:

A. Refrigerant piping shall be installed in strict accordance with the air conditioning unit manufacturer's recommendations. A piping diagram of the refrigeration piping system shall be prepared and submitted for approval. The piping diagram shall be first approved by the air conditioning equipment manufacturer before submittal is made to the Engineer.

B. Refrigerant piping shall be hard drawn type 'K' copper tubing of refrigerant quality with long radius wrought copper solder fittings. Joints shall be made with "Sil-Fos" or approved equal materials. Refrigerant quality shall be piping that is cleaned of all moisture, oil and grease and sealed at the factory.

C. Freon Refrigerant Specialties:

1. A sight glass shall be installed in liquid line to each refrigerant circuit and shall be designed to easily determine a full uninterrupted liquid column and to indicate the presence of moisture. The sight glass shall be Henry "Dri-Vue" liquid indicator or approved equal.

2. A charging valve shall be installed in the system and shall be the forged brass construction of the balance action packless type with wheel handle. The valve shall be equipped with removable cap and chain of the flare connection. The valve shall be Henry type 623 line or type 643 angle type, approved equal or size required.

3. Expansion valves shall be the gas filled type with external equalizers and shall be constructed of bronze. The valves shall be Alco or Sporlan, of sizes as recommended by the manufacturer.

4. Refrigerant valves shall be of bronze bodies with solder ends and shall be as manufactured by Alco or Sporlan. Voltages shall be as required for operation with the control and interlock wiring circuits.

5. Filter Driers: A refrigerant filter drier shall be installed in the liquid line before each expansion valve. The filter drier shall be Sporlan, of sizes as recommended by the manufacturer. In lieu of one filter drier preceeding each expansion valve, a large filter drier of proper size and capacity may be used in the main liquid line in each refrigerant circuit.

15B.23 CONDENSATE DRAINS:

A. Condensate drains shall pitch not less than 1/4" per foot and shall discharge to the floor drains in the Mechanical Rooms.

B. Drain piping shall be type 'L' hard drawn copper tubing with solder type wrought copper fittings. Elbows shall be the long radius type.

C. Provide full size condensate drain line and trap from each cooling coil.

15B.24 FANS:

A. Roof Exhaust Fans: Curb mounted, adjustable belt drive centrifugal type as indicated, complete with aluminum housing, gravity shutter, bird screen, disconnect switch and other accessories as scheduled on the drawings. Where bird screens are specified, they shall be provided as an accessory item and not as an integral part of the support structure.

B. Performance Ratings: Based upon tests conducted in accordance with AMCA Standard 210.

C. Tests: Wheels shall be statically balanced before assembly and the assembled fans shall be dynamically balanced at the speeds at which they are scheduled to operate.

D. Roof Curbs: Designed to match the fans. The curb for fan EF-6 shall be 40" high.

E. Manufacturers: Manufacturer and capacities shall be as noted on the drawings or equal and approved by Jenn-Air, Greenheck or Penn.

15B.25 INSULATION:

A. Blanket Type: Glass fiber duct insulation, 3/4 lb. density with FSK facing. Adhere insulation to duct with duct insulation adhesive covering 100% of duct surface. Install mechanical fasteners not more than 18" on centers on bottom of ducts over 24" wide, seal punctures with FSK tape. Lap longitudinal and circumferential joints 2" minimum and seal with lap adhesive. Do not pull insulation tight around ducts when wrapping. Use 24" minimum length board type insulation on bottom of ducts at trapeze hangers.

B. Duct insulation, including covering or coating shall have a flame spread classification not to exceed 25 and a smoke developed rating not to exceed 50 when tested in accordance with ASTM Designation E48 and shall carry label indicating the fire hazard classification.

C. Type and Thickness:

1. Air Conditioning Sheet Metal Supply Ducts: Blanket, 1-1/2" thick

D. Return, Exhaust Outdoor Air and Combustion Air Ducts: Do not insulate. Refer to paragraph 13I in this section of specifications for internal duct liner.

E. Supply Ducts with Internal Duct Liner: Insulate as specified above.

F. Condensate Drain Lines: 1/2" thick Armaflex with joints sealed with Armaflex adhesive. Do not split insulation longitudinally. Paint all insulation with two coats white Armaflex Vinyl Lacquer Protective Coating.

G. Refrigerant piping insulation shall be Armaflex pipe insulation 3/4" thick for suction lines. Insulation shall not be split longitudinally. Joints shall be sealed with Armaflex adhesive. Paint all insulation with two coats of white Armaflex Vinyl Protective Coating.

H. Kitchen Range Exhaust Duct and Range Hood: Insulate the top of range hood and range exhaust ducts with 2" thick 6 lb. density rigid fiberglas duct insualtion with scrim finish. Insulation shall be glued to ducts and hood with joints butted and further anchored with Graham Insul-Pins and clips. Seal all joints and seams with asphalt cutback mastic.

I. Installation: Work shall be performed by workers regularly employed as insulators with at least three years experience.

J. Insulation Manufacturers: Owens Corning; CSG; Johns-Manville; Armstrong Cork; Baldwin-Ehret-Hill; BFG.

15B.26 MOTORS:

A. General: Motors for belt driven equipment shall have cast yoke and bearing housings. All motors shall have rated horsepower at least 10% above indicated brake horsepower of equipment including belt losses.

B. Voltages: All motors shall conform to the following voltages:

1. Up to and Including 1/2 HP: 120 volts

2. Over 1/2 HP:

(a) 200 volt motors on 208 volt systems
(b) 460 volt motors on 480 volt systems

15B.27 HANGERS:

A. Pipe hangers shall be spaced close enough to maintain an even grade without sagging and in no case shall be spaced greater than 8' on centers. Hangers shall be spaced close enough to heavy connections to relieve the strain on the joints. Hangers shall be Fee & Mason Fig. 239 or Grinnell Fig. 260.

B. Hanger rods shall be the standard machine screw type.

15B.28 SLEEVES:

A. Sleeves shall be provided at all locations where pipes and ducts pass through building construction.

B. Sleeves for ducts shall be of not lighter than 16 ga. galvanized steel. Sleeves shall be set in place and provided with temporary internal bracing to prevent deformation of sleeve during construction of wall or floor. Sleeves shall be approximately 1/2" larger than duct plus insulation for insulated ducts. Insulation shall be continuous through sleeves.

C. Sleeves for piping shall be approximately 2" larger than pipe for uninsulated pipe and approximately 1/2" larger than pipe plus insulation for insulated pipe. Sleeves shall be of Schedule 40 galvanized steel pipe sections cut to length to be approximately flush with both sides of building construction. Sleeves shall be seamed after cutting. Pipe insulation shall be continuous through sleeves.

15B.29 CONTROLS:

A. General:

1. The control system shall be of the electric type. All controls systems shall be complete with all devices and accessories required to make a complete job.

2. Control devices shall be as manufactured by Barber-Coleman, Johnson Service Company, Minneapolis-Honeywell or Robertshaw.

B. Control System Components:

1. Space Thermostats: Electric automatic changeover type, snap action with concealed set point adjustment. Mount 5'-0" above finished floor in the locations indicated on the drawings. Each thermostat shall be mounted on a sub-base with "System-Auto-Off" and "Fan-On-Auto" switches.

2. Firestats: Electric type, snap action with manual reset. Mount as indicated in Sequence of Operation. Set points shall be as follows:

   (a) Return Air to Furnaces: 165°F
   (b) Exhaust Air to Exhaust Fans: 125°F
   (c) Range Exhaust Hood: 275°F

C. Electrical Work: All control and interlock wiring shall be provided under the Electrical Section of the specifications. All devices and controls system components shall be provided under this section for installation under the Electrical Section.

D. Submittal Data: The Contractor shall submit for approval six copies of submittal data to include the following:

1. Control diagrams

2. Electrical interlock diagrams

3. Specification sheet for each device to be supplied

4. Description of functions, sequence of operations and interlocks printed on the control drawings.

E. Mounted Diagrams: Permanently mount a white print copy of control and interlock diagrams and narrative descriptions in a readily accessible location in the Mechanical Room, 5'-0" above finished floor. Diagrams shall be mounted in frames under 1/8" clear plastic; half size reproductions will be acceptable.

F. Calibration: Upon completion of the installation, the Contractor shall test and calibrate all controls provided under this section of the specifications and shall file a written report with the Architect attesting to proper operation.

G. Sequence of Operation:

1. All operators to be in 'NORMAL' position when the furnace fans are 'OFF'.

2. Furnace F-1 and Condensing Unit CU-1; F-2 and CU-2 and F-3 and CU-3.

   (a) Space Temperature Control: Electric space thermostats shall maintain space temperature. On call for heating,

gas heat exchangers shall energize in stages to maintain space temperature. On rise in space temperature, refrigerant solenoid valves shall open and compressors shall unload or cycle to maintain space temperatures.

(b) The systems shall be started and stopped by switches in the thermostat sub-bases.

(c) The following safety controls shall stop the unit fans:

(1) Internal safety controls furnished with the units.

(2) Firestat in the return air duct to the units. Mount in the duct before dilution by outdoor air.

(d) Condensing Unit: Air cooled condensing units shall be interlocked with the furnace to operate only when the fans are running. Compressors shall be arranged for 'On-Off' or pumpdown control as recommended by the unit manufacturer for the application.

3. Exhaust fans EF-1, EF-2 and EF-7: Started and stopped by wall mounted fan-light switches located as indicated on the plans. Provide a firestat at the inlet to each fan.

4. Exhaust Fans EF-3 and EF-4: Interlocked with their respective furnace units. Provide for each fan a wall mounted 3-hour timed override switch, located as indicated on the plans, to start each fan during those periods the furnace unit fans are off. Provide a firestat at the inlet to each fan.

5. Exhaust Fan EF-5 and EF-6: Interlock fan EF-5 with fan EF-6 to run together. The fans shall be started and stopped by a single wall mounted 2-speed on-off push button station located as indicated on the drawings. Motors for both fans shall be 2-speed. Provide a firestat in the range exhaust hood and provide a firestat in the discharge duct from EF-5.

6. Exhaust Fan EF-8: Started and stopped by a wall mounted fan switch located as indicated on the drawings. Provide a firestat at the inlet to the fan.

7. Unit Heaters UH-1, UH-2 and UH-3: Controlled from wall mounted thermostats located as indicated on the drawings. Each thermostat shall have a sub-base containing "System-On-Off" switch to start and stop its respective unit heater.

8. Time Clock Control: Furance F-3 only shall be under the dictates of a 7-day time clock, located as indicated on the drawings. The time clock shall feature spring-wound carry over and shall have day omitting device. A wall mounted night thermostat, located as indicated, set at 50°F (adjustable) shall override the time clock during its 'OFF' cycle should the space temperature drop below the set point. In addition, a wall mounted 6-hour timed override switch, located as indicated, shall override the time clock during its 'OFF' cycle.

9. Room Air Conditioning Unit: Complete with factory mounted integral controls.

10. Electric Cabinet Heaters: Complete with factory mounted integral controls.

11. Electric Duct Heater: Controlled from a wall mounted thermostat to maintain set point temperature.

15B.30 TEST AND BALANCING:

A. Method: Testing and balancing shall be performed in accordance with these specifications by an AABC or NEBB certified Test and Balance agent.

B. Instruments: Instruments used for balancing air systems must have been calibrated within a period of six months prior to balancing. Types of all instruments shall be listed in the final balance reports.

C. Certified Balance Reports: Three copies of the balance report shall be submitted prior to request for final inspection. This report shall include the data listed below for each system.

D. Air Balance Performance Requirements:

1. Measurements: Air quality measurements in main and branch ducts shall be made by pilot tube traverse of the entire cross sectional area of the duct. Ducts having velocities of 1000 or more feet per minute shall be measured with inclined manometers, draft gauge or magnehelic gauges; ducts having velocities of less than 1000' per minute shall be masured with micromanometers, hook gauges or similar low pressure instruments.

2. Duct Openings: Openings in ducts for pitot tube insertion shall be sealed with snap-in plugs after air balance is complete.

3. Outlet and Inlet Air Quantities: Determine by direct reading velocity meters in accordance with outlet and inlet manufacturer's recommendations.

4. Adjustments: Total air quantities shall be obtained by adjustment of fan speeds. Branch duct air quantities shall be adjusted by volume or splitter dampers. Dampers shall be permanently marked after air balance is complete so that they can be restored to their correct position if disturbed at any time. Final air quantities shall be within plus or minus 5% of those called for on the drawings.

E. Air Balance Data - Air Conditioning Equipment:

1. Installed Air Conditioning Units and Fans:

   (a) Unit designation
   (b) Size and manufacturer
   (c) Motor HP, volts, phase, cycles, full load amps

2. Test Results:

   (a) Total CFM
   (b) Static pressure, total and componenets, i.e., coil, filter
   (c) Motor amps
   (d) Outside air, CFM
   (e) Fan RPM
   (f) Fan BHP
   (g) Coil air inlet and outlet dry and wet bulb temperatures
   (h) Return and outside dry and wet bulb temperature

3. Individual Outlets and Inlets:

   (a) Outlet and inlet identification, location and room designation
   (b) Required and resultant test velocities
   (c) Required and resultant test quantities in CFM
   (d) Deflector and/or diffusion cone settings.

F. Element Tests, All Heat Transfer Equipment:

1. Test Results: These readings must be taken during operational test:

   (a) Unit designation
   (b) Entering and leaving air temperatures (DB & WB on cooling coils)
   (c) Pressure drop, air
   (d) Amperage and voltage

G. Filters:

1. Description of condition
2. Pressure drop

H. All Safety Controls: Verify operation, tabulate list of controls and confirm same.

I. All Motors:

1. Nameplate data
2. Operating amps and voltage

J. Adjusting Minimum Outside Air Quantities: Minimum outside air quantities shall be established from measurements of return, outside and supply air, using a 12" long glass thermometer with $1/2^{O}F$ divisions. Minimum outside quantity shall be made after complete adjustment of supply air quantity.

K. Controllers: Tabulate settings of all controllers, individual by location, equipment or space.

L. Sensors: Record temperature at all sensors, equipment, space, duct and settings of controllers.

M. Installed Data: Where installed data is specified, complete specified data on piece of equipment shall be included in report.

15B.31 OPERATIONAL TEST:

A. Test: After the system balance has been completed, the Contractor shall perform an operational test over a minimum period of eight hours. This test shall be performed only after each piece of equipment has been individually tested and is in correct operating condition and shall be made at a time when outdoor dry bulb temperature is above 85^{0} or below 50^{0}. When test is run during the cooling cycle, all lights shall be turned on and doors to all spaces shall be closed and all space thermostats set as indicated on the drawings and in the Controls Specifications. The following information shall be submitted in triplicate with the data specified under Balancing:

1. Temperature of each conditioned space with dry bulb setting of thermostat controlling.

2. Data and outdoor DB and WB range at the time indoor temperatures were recorded.

SECTION 16

ELECTRICAL

16.01 SCOPE:

A. General: Provide a complete electrical system as described herein and as shown on the drawings.

B. Items Included: Items under Division 16 shall include but not be limited to:

1. Power and lighting distribution complete, beginning with secondary service and extending through all branch circuits.

2. Lighting fixtures and lamps.

3. Emergency generator and transfer switch.

4. Panelboards

5. Public address system

6. Raceway for telephones

7. Raceway for TV antenna system

8. Raceway for communications cable

9. Door buzzer system

10. Fire gong

11. Power and control wiring for all electrically operated equipment.

16.02 APPLICABLE SPECIFICATIONS AND CODES: All work shall conform to the local electrical code and the 1978 National Electric Code. All materials and equipment included in Underwriters Label Service shall bear that label. Where requirements of these specifications and the accompanying drawings exceed the codes, conform to these specifications.

16.03 COMPLETION OF WORK:

A. Testing: At the completion of work, a test shall be made and the entire system shall be shown to be in perfect working condition. The following shall be made available to personnel conducting the test:

1. Electrician with hand tools.
2. Accurate voltmeter
3. Clamp-on ammeter
4. Test lamp
5. Phase rotation indicator
6. Complete electrical specifications and drawings with addenda and revisions.

16.04 SPACE CONDITIONS: All apparatus shall fit into the available spaces in the building and must be introduced into the building so as not to cause damage to the structure. All equipment requiring service shall be accessible.

16.05 DRAWINGS: Drawings are diagrammatic and show generally the location of the lighting, lamps, wiring, raceways, switches and accessories and are not to be scaled. All dimensions shall be verified at the building site. Prefabrication of work from drawings shall be at Contractor's risk.

16.06 WORKMANSHIP AND MATERIALS:

A. Workmanship: All work necessary to complete the project shall be executed in a thorough, neat and workmanlike manner.

B. Materials: All materials shall be new and equipment included in Underwriters Label Service shall bear that label.

C. Substitutions: Ten day written prior-approval required.

16.07 SHOP DRAWINGS:

A. Contractor's Approval: Each copy of shop drawings shall be signed and dated by Contractors as evidence of checking to ensure compliance with plans and specifications. Unsigned drawings will be returned.

B. Submittals: Shall be assembled, bound with an index sheet and shall be submitted at one time unless unavailable drawings would delay project. Submittal shall include but not be limited to:

1. Emergency generator
2. Panelboards
3. Circuit breakers
4. Disconnect switches
5. Wiring devices and plates
6. Lighting fixtures
7. Public address system
8. Time clocks
9. Conduit and wire
10. Floor boxes

16.08 APPARATUS OF OTHER TRADES:

A. General: No roughing shall be done until roughing drawings are furnished by other trades.

B. Mechanical Equipment:

1. Provide line voltage power and control wiring through starters, contactors and control devices for mechanical systems.

2. Provide conduit, wiring, boxes and disconnect switches.

3. Starters and contactors are furnished under this division except as outlined in 16.24.

4. Low voltage control and interlock devices are furnished under Division 15.

C. Other Equipment: Lab, kitchen and other equipment specified in other divisions of this specification shall be connected as required for operation and any appurtenance required for final connection are to be included under this division.

16.09 CONDUIT:

A. General: Conduit shall be galvanized or sheradized rigid conduit, intermediate metallic conduit or electrical metallic tubing. Conduits in explosion proof areas shall be rigid. Conduits 1-1/2" and larger, exposed below 5'-0", branch circuit to motors, conduits in ground, slab or walls on or below grade, or exposed to weather shall be IMC or rigid. PVC conduit shall be used for telephone, television and public address system wiring. Elsewhere conduit shall be EMT.

B. Connectors and Couplings: Same material and finish as raceway. IMC rigid shall be threaded. EMT shall be split ring compression type and/or tap-on type. Indenter or set screw type are not acceptable.

C. Threads: Cut clean and remove rough edges. Running threads shall not be used.

D. Pullboxes: Specified in NEC Article 370.

E. Insulating Bushings: On all conduits entering raceways, pullboxes, cabinets, stubs, panelboards, switchboard and motor control centers.

F. Insulated Throat Connectors: On all EMT connections and on EMT entering outlet boxes, cabinets, panels, switchboard and motor control centers.

G. Connections to Motors: Where over 18" from walls or column, a vertical conduit, minimum size 3/4" attached to ceiling and floor with wiring into and from this conduit with flexible conduit and condulets.

H. Conduits in Contact with Ground: Coat complete with two coats of asphaltic paint or use conduit with 20 mil bonded coat of PVC.

I. Expansion Fittings: Appleton, Crouse-Hinds or O.Z. at all expansion joints.

J. Capping: Cap conduits exposed during construction to prevent entrance of moisture or foreign matter, use T&B Push-Pennies.

K. Plugging: All conduit runs which extend from interior to exterior of building and those that enter and leave refrigerated spaces shall be sealed to prevent the circulation of air. This shall be done by stuffing the conduit ends with asbestos wicking where the conduit run terminated inside the building or outside the refrigerated spaces in the outlet box or panel, as the case may be.

L. Manufacturers: Allied, Clifton, Cavalier, Jones & Laughlin, Republic, Triangle, Wheatland, Wheeling or Youngstown.

M. Conduit Routing:

1. Clearances: Maintain 3" crossing hot piping and 12" paralleling.

2. Concealed: Where possible

3. Exposed Routings: Run parallel or at right angles to the building lines.

4. Supports: Individual runs shall be anchored in place within 3' of changes in direction and at intervals not over 8' by means of straps or clamps specifically designed for the purpose. Wire, hanger iron, nails and other means shall not be used. Do not strap to other piping. Multiple runs shall be supported by assemblies or trapeze type hangers to provide a rigid installation. Anchor supports by means of toggle bolts on hollow masonry units, expansion anchors on solid masonry units and machine screws on steel work.

16.10 FLEXIBLE CONDUIT:

A. General: Short lengths for connection rotating or vibrating machinery or equipment, 6' lengths maximum for connection to lighting troffers. B-X cable is not acceptable. Flexible connections to motors shall not be less than four diameters nor more than 24" in length and shall be liquid tight neoprene coated for motor connections and where subjected to moisture. Provide separate grounding conductor in flexible conduits.

B. Connectors: Steel, zinc or cadmium plates. Fittings that anchor the conduit by means of set screws are not acceptable.

16.11 CONDUCTORS (50 to 600 VOLTS):

A. General: Minimum size AWG No. 12 copper with minimum conductance of 98% and unless noted otherwise, solid for No. 10 and smaller, stranded for No. 8 and larger, installed in continuous conduit system.

B. Taps and Joints: Mechanically and electrically sound. Use 3M Skotchloks or Ideal Wing Nut for No. 10 and smaller. Burndy Hydent or T&B Color-Keyed on No. 8 and larger.

C. Tape: All joints shall be covered with gum tape and taped over with friction tape. Vinyl plastic tape may be used in lieu of gum and friction tape.

D. Terminal Lugs: Use for connecting conductors larger than No. 10 and for all multiple connections to terminals. Burndy Hydent or T&B Color-Keyed.

E. Lacing: All wiring in cabinets, panels, pullboxes, junction boxes are to be neatly laced and held with T&B "Ty-Raps".

F. Lubricants: Electro Y-ER-EAS, Ideal Wire-Lube or Minerallac 100.

G. Color Code: In accordance with NEC 210-5. Use 3/4" tape bands corresponding to color code on all wire not available with factory applied color coding.

H. Wire Pulling: Not until conduit system is complete.

I. Conductor Insulation, Unless Noted Otherwise:

1. No. 8 and Smaller: type "THWN-THHN"
2. No. 6 and Larger: type "THW"

J. Manufacturers" Anaconda, Collyer, Crescent, Diamond, General Cable, General Electric, Habirshaw, Hatfield, Hazard, Manhattan, National, Okonite, Rome, Senator, Simplex, Southwire or Triangle.

16.12 OUTLET BOXES:

A. General: Provide outlet boxes for lighting fixtures, wall switches, wall receptacles, inter-communication equipment, antenna, etc. of such form and dimensions as to be adapted to their specific usage, location and size and number of conduits connecting thereto.

1. Concealed:

(a) Boxes and covers shall be not less than 1/16" thick and firmly anchored in place and shall be provided with approved 3/8" fixture studs for fixtures. Except as otherwise specified, ceiling outlet boxes need not be provided with plaster rings and shall be 2" deep or more. Junction boxes shall be provided with blank covers painted to match surroundings.

(b) Ceiling outlet boxes shall be 4" octagonal or 4-11/16" square as specified in NEC due to number of wires; switch and wall receptacles outlet boxes in plastered walls shall be 4" square with standard switch covers. In exposed masonry or tile walls, Steel City Series "GW" boxes shall be used or 4" square boxes with deep plaster covers. Ceiling boxes in slabs shall be concrete type and where slab is not to be plastered, the plaster covers shall be omitted.

2. Exposed: Boxes shall be corrosion resistant cast iron.

3. Pullboxes: Shall be constructed of code gauge welded and galvanized steel. Such boxes shall be sized in accordance with NEC requirements and shall be furnished without knockouts; holes for raceways shall be drilled on the job.

4. Special Boxes: For speakers, fire alarm horns and stations and program signals shall be obtained from the equipment manufacturer.

5. Manufacturers:

   (a) Concealed: Steel City, Appleton, NEPCO, Raco or Sprague.
   (b) Exposed: Crouse-Hinds Condulets, Appleton or Pyle.

B. Location:

1. The approximate locations of outlets are shown on the drawings. The exact locations shall be determined at the building. The right is reserved to change without additional cost, the exact location of any outlet, a maximum of 10' before it is permanently installed.

2. Unless otherwise indicated or directed, wall outlet boxes shall be placed with center lines at distances above the finished floor as follows:

Duplex receptacles (over counters & lavatories)	42"
Duplex receptacles (in aparatus room)	26"
Duplex receptacles (elsewhere)	10"
Light switches	50"
Television outlets	10"
Telephone outlets (over counters)	42"
Telephone outlets (in booth)	54"
Telephone outlets (elsewhere)	10"
Clock outlets	90"
Door buzzers	90"

3. Where outlets of different levels are shown adjacent, they shall be installed in a vertical line.

4. At locations where two or more devices are shown adjacent and at the same mounting height, they shall be installed in one outlet box and covered with one face plate.

5. Where outlets are installed in unfinished block or tile partitions, they shall be installed at the joints in the tile to permit the face plate to cover the rough opening. The horizontal and vertical locations indicated may be altered slightly to permit doing this; however, the Contractor shall check the Architectural drawings to prevent conflicts when shifting location.

16.13 FLOOR BOXES:

A. General: Provide as shown, complete with service fitting or unactivated as indicated.

B. Construction: All boxes in ground floor shall be watertight with threaded hubs. Boxes on other floors shall be concrete tight. All connections shall be made to prevent entrance of moisture. Where outlets are shown adjacent, two or three gang boxes shall be used.

C. Installation: Boxes shall be set and readjusted to provide a smooth surface, conforming to elevation and slope of the surrounding finished floor. In carpeted areas, flanges shall be installed to protect carpet edges.

D. Manufacturers: Hubbell, Steel City, Thomas and Betts.

E. Watertight Boxes: Hubbell B2436(7) (3/4" or 1"); Steel City 600(1); T&B 1966.

F. Concrete Tight Boxes: Hubbell B2529(8); Steel City 88D, T&B 1963(4).

G. Covers: Hubbell S-2525, Steel City P-60-3/4-2 or P-90-3/4-2, T&B 1720 except as listed below.

H. Power Service Fittings:

1. Hubbell SC3091, Steel City SFH-40-RG, T&B 1854 when adjacent to telephone.

2. Hubbell S-3925; Steel City P-60-3/4-2 or P-90-3/4-2 with carpet flange, T&B 202 and 1980 with duplex receptacle when not adjacent to telephone and in carpet.

3. Hubbell S-3725, Steel City P-60-DU or P-90-3/4-2, T&B 202 with duplex receptacle elsewhere.

I. Telephone Service Fittings: Hubbell SC-3090, Steel City SFL-10, T&B 1855.

16.14 NAMEPLATES:

A. General: Provide for all lighting and receptacle panels, power and distribution panel, safety switch, starter, controller, circuit breaker in Main Distribution Switchboard. Mount on exterior of door on all surface panels interior on flush panels.

B. Designation: The usage of each device or circuit shall be etched in 1/4" letters and mounted on device cover except flush panels shall have nameplate mounted inside panel.

C. Type: White core black bakelite adhered with epoxy glue.

16.15 WOOD BACKBOARDS:

A. General: Provide wood backboards for mounting of surface panels, starters, relays, disconnect switches, heating, air conditioning, and plumbing controls, etc.

B. Type: 3/4" thick Grade 1 plywood supported by 3/4 x 3/4 x 1/8 angle iron frame attached to wall with 1/4" toggle bolts.

C. Finish: Frame and board with two coats light gray enamel.

D. Nameplates: Label each device as specified under "Nameplates".

16.16 SERVICES:

A. General: Contact the Georgia Power Company, make all arrangements and pay all costs in connection with the new service.

B. Voltage: 208Y/120V 3Ø 4W grounded wye

C. Secondary Service: Underground as detailed on the drawings.

16.17 PANELBOARDS:

A. General: Provide automatic circuit breaker type panelboards, factory assembled with thermal magnetic molded case circuit breakers of trip ratings as shown on drawings.

B. Boxes: NEMA 1, general purpose and shall have code size side and end gutters, 4" minimum, constructed of galvanized code gauge steel, 20" width x 5-3/4" depth minimum.

C. Fronts: Flush or surface type as scheduled, constructed of code gauge steel, finished with rust inhibiting prime coat and manufacturer's standard light gray enamel. Trim shall be completed with adjustable trim clamps and directory for glass or clear plastic. Directory to be typewritten. Trim on all flush mounted 20" wide panels shall have trim clamps and hinges completely concealed when door is closed.

D. Bus Assembly Arrangement: Distribution phase sequence type vertically numbered so that no two consecutively numbered single poles and/or spaces shall be connected to the same phase for all branch circuit breakers. All current carrying parts shall be plated. See Schedules for special arrangements (i.e., split bus, R/C switches.).

E. Circuit Breakers: Thermal and magnetic molded case; quick-make, quick-break, ambient compensated; toggle operating; bolted bus bars, internal common trip, with all load side connections of the same breaker in the same gutter for multi-pole breakers. All breakers shall have interrupting capacity (UL and NEMA) as scheduled on the plans or not less than 10,000 amperes symmetrical if not noted otherwise.

F. Type: Square D as scheduled or by Federal Pacific, General Electric or Westinghouse.

16.18 SAFETY SWITCH, HEAVY DUTY:

A. General: Provide heavy duty safety switches having the electrical characteristics, ratings and modifications shown on the drawings. All switches shall have: NEMA 1 general purpose enclosures in door or NEMA 3R where exposed to weather unless noted otherwise, handle whose position is easily recognizable that is integral with the switch base and is padlockable in the "OFF" position; visible blades, reinforced fuse clips; non-teasible, positive, quick-make, quick-break mechanisms and switch assembly plus operating handle as an integral part of the enclosure base. All switches shall be UL listed, HP rated, shall have defeatable door interlocks that prevent the door from opening when the operating handle is in the "ON" position and shall have line terminal shields.

B. Manufacturer: Federal Pacific, General Electric, Square D or Westinghouse.

C. Nameplates: Label each device as specified under "Nameplates".

16.19 ENCLOSED CIRCUIT BREAKERS:

A. General: Provide enclosed circuit breakers having the electrical characteristics, ratings and modifications shown on the drawings. All enclosed circuit breakers shall have: NEMA 1 general purpose enclosures indoors, or NEMA 3R where exposed to weather unless noted otherwise; handles that are padlockable in the "OFF" position and remain in positive contact with the breaker handle at all times; non-teasible, positive, quick-make, quick-break mechanisms. Circuit breakers shall be molded case and have minimum interrupting capacity (UL and NEMA) of not less than 14,000 amperes symmetrical at 120/240 volts and 277/480 volts.

B. Manufacturer: Federal Pacific, General Electric, Square D or Westinghouse.

C. Nameplates: Label each device as specified under "Nameplates".

16.20 TIME SWITCHES:

A. General: Provide where shown a time switch with astronomic dial, day omitting device and a 3-way manual switch for each circuit.

B. Motor: The time switch shall be powered by a self-starting synchronous motor with spring-driven reserve, which shall operate the time switch contacts at least 10 hours after power failure. On restoration of power, time switch shall transfer to synchronous motor drive and automatically rewind reserve.

C. Operation: "ON" operation shall occur automatically at sunset. "OFF" operation shall be adjustable from 8:30 P.M. to 2:30 A.M. in one-half hour increments or at sunrise. Both "ON" and "OFF" shall have a range of adjustability of 20 or 40 minutes before or after sunset and sunrise.

D. Electrical Characteristics:

1. Time switch contacts shall be capable of carrying a minimum of 30 amperes per pole continuously at 277 volts and shall be SPDT (or DPST, 3PST). Manual switches shall be provided as an integral part of the time switch, one for each pole, and shall permit manual switching to maintained "ON" or "OFF" positions until manually returned to "AUTOMATIC" position.

2. Terminal strip shall be capable of receiving No. 10 AWG wires.

3. Enclosure shall be NEMA 1 surface type unless noted otherwise, finished in baked gray enamel and with 1/2" - 3/4" combination knockouts on bottom, both sides and top. Provision shall be made for positive padlocking and/or sealing. (Manual switches shall be available when case is locked.)

E. Manufacturer: Tork, Intermatic, Paragon or Sangamo.

16.24 GROUNDING:

A. General: Provide grounding as required by National Electric Code and as indicated and specified herein.

B. Grounding:

1. Conduit and other conductor enclosure.

2. Neutral or grounded conductor of interior wiring system.

3. All panelboards, safety switches, non-current carrying parts of fixed equipment, such as motor and starters.

4. Provide a separated grounding conductor in all flexible conduit.

5. Provide a grounding conductor for ground pole on each receptacle to the conduit system.

6. Provide a code bare copper wire bonded from main panelboard bus to water service. Attach to ground clamps on line side of main cutoff valve.

7. Provide "TW" copper wire to water pipe for telephone equipment as directed by Telco.

16.22 WIRING DEVICES:

A. General: Provide devices as specified herein and as shown on the drawings. Receptacles not specified herein but shown on the drawings shall be of similar construction and NEMA configurations.

B. Devices:

1. Switches:

	Arrow-Hart	Bryant	Gen. Elec.	Hubbell	Pass & Seymour
SPST	1991-I	4901-I	GE5951-I	1221-I	20AC1-I
Three-Way	1993-I	4903-I	GE5953-I	1223-I	20AC3-I
SPST-Key	1991-L	4901-L	GE5951-OL	1221-L	20AC1-L
SPST w/Pilot	2999-R	4901-PLR	-----	1297	----
SPDT (Momentary)	1895-I	4821-I	------	1556-I	1250-I

2. Convenience Outlets:

Simplex (15A-120V)	5261-I	5261-I	GE4064-I	5261-I	6201-I
Duplex (15A-120V)	5262-I	5262-I	GE4065-I	5262-I	6200-I

3. Special Outlets: Provide to match equipment served.

16.23 DEVICE PLATES:

A. General: Provide suitable plate for all outlets and install with all edges in contact with finished wall. Mount plates vertically.

B. Gangs: Where two or more devices are shown adjacent, they shall be mounted in ganged boxes and covered with one face plate.

C. Size: Plates shall be standard size, except where necessary to cover masonry openings jumbo plates shall be used.

D. Finish:

1. Device plates on exposed boxes shall be galvanized steel.

2. Weatherproof covers shall be Sierra WP-8.

3. All other device plates shall be satin stainless steel, Sierra C361.

16.24 STARTERS AND CONTACTORS:

A. General: Line voltage motor control equipment not furnished integral with mechanical equipment is to be provided under this section.

B. Three Phase, Single Speed Motors: Magnetic across-the-line starter with H.O.A. switch in cover of NEMA 1 enclosure. Square D, Class 8536; Allen-Bradley Bulletin 709; Cutler-Hammer Catalog 9586. Provide auxiliary contacts as required by control diagrams furnished under Division 15.

C. Single Phase, Multi-Speed Motors: Manual starter in NEMA 1 enclosure; Square D, Class 2510; Allen-Bradley Bulletin 600; Culter-Hammer Catalog 9101.

D. Single Phase, Two Speed Motors: Manual starter with stainless steel flush plate; High-Off-Low selector switch with two pilot lights; Square D 2512; Allen-Bradley 600; Cutler-Hammer 9101.

E. Single Phase, One Speed Motors: Manual starter in NEMA 1 enclosure, unless otherwise noted; Square D, Class 2510; Allen-Bradley Bulletin 600; Cutler-Hammer Catalog 9101.

F. Single Phase, One Speed Motors Operated from Wall Switch: Manual starter with stainless steel flush plate and red pilot light; Square D, Class 2510; Allen-Bradley Bulletin 600; Cutler-Hammer Catalog 9101.

G. Single Phase Motors 1/2 HP and Larger and/or Interlock Controlled: All single phase motors 1/2 HP and larger and/or interlock controlled shall have magnetic starters.

H. Remote One-Speed Push Button Station: Remote one-speed, start-stop station, with pilot lights, Square D Class 9001 enclosure; Allen-Bradley Bulletin 800; Cutler-Hammer type standard. Provide stainless steel flush plate.

I. Overload Elements: All legs of multi-phase starters shall be protected with overload elements. Overload elements shall be sized in accordance with National Electrical Code.

J. Remote Push Button Stations: Remote push button stations shall be flush mounted unless otherwise indicated.

K. Coils: All holding coils shall operate on 120 volts. On 208 volts starters, coil voltage shall be obtained by neutral conductors.

L. Pilot Lights: Provide a pilot light with green jewel in cover, lit when starter is closed, for all magnetic fan and pump motor starters.

M. Air Conditioning Equipment: Provided with equipment.

16.25 LIGHTING FIXTURES:

A. General: Provide lighting fixtures of types and sizes as indicated on drawings complete with plaster frames, supports and mounting accessories. Fixtures shall be left clean at completion of project.

B. Ballast:

1. Fluorescent: Rapid start, high power factor, ETL-CBM type 'P' as manufactured by Advance, General Electric or Jefferson.

2. Mercury Vapor High Power Factor - CWA

C. Fusings: All fluorescent and high intensity discharge fixtures are to have fusing on each ungrounded leg on the line side of the ballast. Fuses shall be Buss GLR, KTQ or KTK to conform to voltage and ampacity. Fuses shall be sized a minimum of 2.5 times the normal operating current of the ballast.

D. Suspension:

1. Grid Troffers: Omit hangers and fasten to inverted tees with holddown clips.

2. Surface and Recessed Incandescent: For ceiling support systems with members 2' on center, use fixture support brackets supplied by manufacturer. Where no bracket is supplied by manufacturer and where span exceeds 2', provide two 1-5/8" x 7/8" x 12 ga. minimum channels spanning ceiling supports except as noted. Secure fixture supports to ceiling supports with 18 ga. stainless steel wire ties.

3. Flanged Troffers, Surface Fluorescent or Recessed Quartz: Support from structural system with two 3/8" threaded rods unless otherwise noted. Use nut and locknut to secure fixture. For fixtures not connected with flexible conduit, the Contractor shall verify exact location of fixture knockouts and wireway prior to roughing outlet box.

4. Exit Fixtures: Support from structural system with one 3/8" threaded rod attached to ciling box. Also provide two 1-5/8" x 7/8" x 12 ga. channels bolted to the sides of the ceiling box and spanning two ceiling tees.

E. Structural System Attachments:

1. Steel Bar Joists or Steel Beams: 1-5/8" x 3/4" x 12 ga. channel bolted to top chords. Drill channel and secure threaded rods to channel with nut and locknut unless otherwide noted.

2. Along Bar Joist or Steel Beam Center Line: F&M Fig. 255, Grinnell Fig. 88 or Elcen Fig. 29 beam clamps unless noted otherwise.

F. Fixture Ceiling Compatibility: Fixture numbers scheduled are for general design only (i.e., size, number of lamps, lents, etc.) Contractor is to verify type ceiling system (plaster, sheetrock, grid, spline, etc.) to be used and order appropriate fixtures complete with all necessary accessories as required for ceiling system.

G. Bases: Bases for exterior lighting units shall be as detailed on the drawings.

H. Manufacturers: As scheduled on drawings.

16.26 LAMPS:

A. General: Provide for all fixtures. Fixtures shall be left clean and lamps burning at completion of project.

B. Manufacturer: General Electric, Sylvania or Westinghouse.

1. Fluorescent: standard cool white
2. Incandescent: 130 volt type as scheduled on drawings
3. Mercury Vapor: deluxe white

16.27 FIRE STATION PUBLIC ADDRESS SYSTEM:

A. General: Furnish and install a complete intercom system in fire station as specified. System shall be wired and left in first class operating condition. The system shall provide sound reinforcement from microphones as shown on drawings.

B. Equipment: Equipment specified shall be that of Webster, Bogen, Rauland or Dukane. Model numbers shown are Webster.

1. Microphones: Low impedance, 50 50 15,000 Hz frequency response, dynamic type microphones. WSM-130 desk type with ON/OFF switch.

2. Speakers: 8" diameter, 8 Ohms resistance, 25 watts peak power, 50-13,000 Hz frequency response (WSS-273) with WSB51 trim ring and grill (white) and WSB95 back box. Speakers shall be driven from 25 volt line matching transformer. Support speaker assembly on channels spanning ceiling grid members. Weatherproof speakers shall be WSS215 with 250 to 10,000 Hz frequency response.

3. Amplifier: Provid Solid State mixer amplifier with minimum of four low impedance microphone inputs for simultaneous operation. Output shall be 25 volt line with 40 watts music power. RWA440 amplifier, WSC662 AC power panel and T-608-3 tuner. Unit shall have suitable enclosure for counter-top mounting.

4. Raceway: Provide 3/4" PVC conduit from wall boxes to ceiling space above ceiling. Also provide conduit through spaces which are unaccessible (such as transistion from high roof to low roof). Cable to be run exposed in ceiling space where space is accessible.

5. Cable: Speaker cable shall be two wire, 22 ga. twisted copper West Penn 220 or equal. Microphone cable shall be shielded 22 ga., two wire West Penn 290 or equal.

6. Switches: ON/OFF volume control switches shall be Soundolier AT-10.

16.28 TELEPHONE RACEWAY SYSTEM:

A. General: Provide entrance, backboard, outlets and raceways at locations shown on the drawings.

B. Entrance: Provide conduits as shown on drawings.

C. Backboard: See "Backboards".

D. Wall Outlets: Flush boxes with bushed telephone plates.

E. Raceway: 3/4" to telephone backboards. Leave No. 16 galvanized pullwire or nylon cord in conduits.

16.29 TELEVISION ANTENNA RACEWAY SYSTEM:

A. General: Provide antenna weatherhead and entrance conduit, backboard, outlets, conduit and pull wires for future antenna system to be installed by Owner.

B. Entrance: Provide conduits as shown on drawings.

C. Backboard: See "Backboards".

D. Outlets: 2 gang flush boxes with bushed telephone and duplex receptacle plate.

E. Conduit: 3/4" unless noted otherwise with long radius (9") bends. Leave No. 16 galvanized steel pullwire.

16.30 EMERGENCY GENERATOR:

A. General: The installation of a standby electric generating system shall include an Onan 12JC series electric plant rated for continuous standby service at 12.5-KW-208Y/120V, 60-cycle. The system shall be a package of new equipment consisting of:

1. A gasoline engine driven electric plant to provide emergency electric power.

2. An automatic load transfer control to provide automatic starting and stopping of the plant and switching of the load.

3. Mounted accessories as specified.

4. Weatherproof enclosure.

This system shall be completely built, tested and shipped by a manufacturer who has been regularly engaged in the production of such equipment for the past ten years and who has parts and service facilities locally available so there is one source of supply and one responsibility. The performance of the electric plant shall be certified by an independent testing laboratory as to the plant's full power rating and voltage and frequency regulation.

B. Engine: The engine shall be air-cooled, gasoline-fueled, 4-cycle, 4-cylinder. It shall have a total piston displacement of no less than 120 cubic inches and develop no less than 30.5 HP at its operating speed of 1800-rpm. A hot air discharge duct adapter shall be provided for a connecting duct to allow all heated air and gases to be discharged out of the building or enclosure through one opening. The engine shall be of cast alloy iron construction with cast aluminum alloy heads. Valves shall be overhead and free to rotate. Intake valves shall be alloy steel with replaceable inserts. Exhaust valves shall be hard chrome-cobalt alloy faced with replaceable exhaust seat inserts of solid chrome-cobalt alloy. The crankshaft shall be ductile iron. The connecting rods shall be forged steel with replaceable inserts. There will be full pressure lubrication to the main and connecting rod bearings. The engine shall be equipped with adjustable gear-driven governor (speed regulation 5%, no-load to full-load); horizontal carburetor with a reusable element air cleaner; automatic electric choke; diaphragm type fuel pump with fuel filter; full flow, replaceable, oil filter with by-pass; oil pressure gauge and 12-volt battery ignition with radio suppression.

C. Alternator: The alternator shall be a 4-pole revolving field type with static exciter and magnetic amplifier voltage regulator. No commutator or commutator brushes shall be allowed. The alternator shall be directly connected to the engine through a rigid coupling to insure permanent alignment. Voltage regulation shall be within plus or minus 3% of rated voltage, from no-load to full-load. The instantaneous voltage dip shall be less than 12% of rated voltage when full-load and rated power factor is applied to the alternator. Recovery to stable operation shall occur within two seconds. Stable or steady-state operation is defined as operation with terminal voltage remaining constant within plus or minus 1% of rated voltage. Temperature rise shall be within rating as defined by NEMA MG1-22.40. Radio interference reduction shall exceed requirements for general civilian and commercial applications.

D. Control: A control box mounted atop the alternator shall contain the charge rate ammeter, start and stop switch for manual operation and terminals for connection to the automatic load transfer control.

E. Electric Plant Mounting: The plant shall be provided with shock or anti-vibration mounts, and shall be housed in a weather protective housing and mounted on a 6" concrete pad.

F. Accessories: All accessories needed for the proper operation of the plant shall be furnished. These shall include a muffler, flexible exhaust connection, starting batteries, battery cables, fuel tank and lines, emergency hand crank and detailed operation and maintenance manuals with parts list.

G. Automatic Load Transfer Control: The complete control shall be designed, built and tested by the manufacturer of the alternator. It shall include the necessary relays and component parts, together with UL listed and tested electrically or mechanically interlocked contactor, and shall provide the following functions:

1. Upon power line outage, automatically start the plant and when the plant comes up to voltage, disconnect the load circuits from the main line and transfer them to the standby plant's output.

2. Upon power line return, transfer the load circuits back to the line and stop the plant.

3. Automatic Operation, Stopping, Checking or providing manual cranking of the plant by means of a 4-position, manual control selector switch.

4. A cranking limiter shall be provided to protect the batteries and starting circuit. It will open the starting circuit in approximately 45 seconds if the plant has not started within that time.

Each contact pole of the main transfer device shall be double break design, with solid silver cadmium contacts, capable of handling both noninductive and inductive loads and allow for in-rush currents of 20 times the continuous rating. Contact pressure shall be maintained by a coil spring, not a part of the current carrying path. The ampere rating of the transfer switch shall be sufficient to handle the capacity of the plant and loads being transferred. The control shall contain a 12-volt, fused, battery trickle charging circuit with a rheostat and ammeter, to maintain starting batteries fully charged.

H. Fuel Tank: A 110-gallon underground fuel tank not less than 16 ga. steel shall be furnished and installed. Tank shall be provided with rust preventive black asphalt coating to insure long life. A filler pipe fitted with screen and locking type cap shall be included. Copper tubing for fuel supply line and fittings shall be furnished with plant. Provide vent piping.

I. Exhaust Pipe: Schedule 40 black steel pipe with buttweld fittings.

16.31 DOORBELL BUZZER SYSTEM:

A. Provide and install doorbell buzzer system complete as shown on the drawings and as specified herein.

B. Buzzers: Edwards 115-2G5 adjustable volume buzzer for installation in the Company Officer's room, space 125. Edwards 340A-G5 adjustable volume buzzer for installation in the Day Room, space 118 and in the Kitchen and Dining Room, Space 115. All buzzers shall be for 24VAC operation.

C. Transformer: Edwards 598, 120 VAC primary, 24 VAC secondary, 30VA; install on junction box above ceiling in Day Room.

D. Pushbutton: Edwards 852 flush weatherproof with rubber gasket and satin chrome plate. Install in recessed box at entry door.

E. Conductors: 20 ga. low voltage control wiring run exposed above ceiling, except PVC conduit shall be provided from wall boxes to space above ceiling.

16.32 FIRE GONG: Provide and install a Gamewell 6211 10" gong, chain wind, for wall box mounting. Mount where shown in Equipment Room, space 101, and provide 3/4" PVC conduit back to telephone panel.

16.33 CLOCKS: Provide and install clock receptacles and clocks where shown on the plans and as specified herein. Receptacle shall be Hubbell 5235. Clock shall be Simplex 58-45, round, 12" dial for surface mounting. Equal clocks by Standard or Edwards.